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Everything New Is Old Again: Brain Fingerprinting and Evidentiary Analogy

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EVERYTHING NEW IS OLD AGAIN: BRAIN FINGERPRINTING AND EVIDENTIARY ANALOGY

ALEXANDRA J. ROBERTS^{*}

9 YALE J. L. & TECH. 234 (2007)

Metaphors in law are to be narrowly watched, for starting as devices to liberate thought, they end often by enslaving it.

J. Cardozo¹

Whatever produces the judge's hunches makes the law.

Jerome Frank²

ABSTRACT

Brain Fingerprinting uses electroencephalography to ascertain the presence or absence of information in a subject's brain based on his reaction to particular stimuli. As a new forensic tool, Brain Fingerprinting technology stands poised to exert a tremendous impact on the presentation and outcome of selected legal cases in the near future. It also provides a fertile case study to examine the role of analogical reasoning in the process by which lawyers, experts, judges, and the media influence how fact-finders perceive and evaluate unfamiliar types of proof. When juridical metaphor disguises, distorts, or destroys ideas, it ceases to serve as an aid to understanding and functions instead as an obstacle to knowledge. This Note explores the ways in which evidentiary analogy may insidiously shape how courts treat novel forms of scientific evidence.

^{*} Yale Law School, JD candidate 2008. Many thanks to Dr. Lawrence Farwell, Professor Dan Kahan, E. Elliot Adler, David Henson Smith, Lucy Wang, Gabriel Rosenberg, & Gregory Ruben.

¹ *Berkey v. Third Ave. Ry. Co.*, 155 N.E. 58, 61 (N.Y. 1926).

² JEROME FRANK, *LAW AND THE MODERN MIND* 104 (1930).

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INTRODUCTION

Approaching novel forms of evidence through analogy to older and ostensibly better-understood forms can appear natural and even inevitable. Reasoning by analogy, metaphor, and prototype forms the heart of American legal procedure, dominates lawmaking, and typifies the manner in which rational thinkers understand new information and incorporate new ideas into their cognitive schema. Such processes comprise “the meat and potatoes of legal reasoning”;³ “the common, imaginative core of human rationality.”⁴ Analogical reasoning can render the alien, familiar; the obscure, comprehensible; the frightening, innocuous; the complex, simple. Yet we often ignore the damage done in the process: When the assimilation of new information takes place too swiftly and too smoothly, that ease may mark a failure to appreciate and assess precisely the novelty and difference that prompted the initial analogy. When it enacts violence upon ideas by disguising, deforming, or destroying them, metaphor ceases to serve as an aid to understanding and functions instead as an obstacle to knowledge.

Many have written extensively on the role of heuristics⁵ and cognitive illusions in legal decision-making and their effects on the quality

³ David Hricik, *Reading Too Much Into Nothing: The Metaphor of Place and the Internet*, 55 MERCER L. REV. 859, 860 (2004). Hricik notes that his Westlaw search seeking “Internet” in the same sentence with “analogy or metaphor” spawned 26 cases and 700 law review articles. *Id.* at 860.

⁴ Steven L. Winter, *Death Is the Mother of Metaphor*, 105 HARV. L. REV. 745, 753 (1992) (reviewing THOMAS C. GREY, *THE WALLACE STEVENS CASE: LAW AND THE PRACTICE OF POETRY* (1991)).

⁵ Heuristics are mental shortcuts or rules of thumb employed unconsciously to enable faster decisions. Cognitive scientists vary in the degree to which they find heuristics helpful or harmful, but “virtually everyone agrees that sometimes heuristics can get in the way of optimal decisionmaking.” Erica Beecher-Monas, *Heuristics, Biases, and the Importance of Gatekeeping*, 2003 MICH. ST. L. REV. 987, 995-96 (2003) (discussing how cognitive biases may affect evaluation of evidence and advocating for expansive gatekeeping). For example, three of the best-known heuristics are the representativeness, availability, and anchoring heuristics. The “representativeness” heuristic relies on comparing known or salient characteristics to a prototype, ignoring base rates; for example, in evaluating the probability whether Paul, an intelligent and argumentative person, is a lawyer or a waiter, most will judge him more likely to be a lawyer despite the fact that waiters outnumber lawyers significantly in a given sample group. According to the “availability” heuristic, people will over- or underestimate the likelihood that a given event will occur based on how quickly instances of similar events come to mind; for example, people will assume shark attacks occur far more often than they do if they have recently seen a shark attack in the news. The “anchoring and adjustment” heuristic says people will estimate an unknown value by beginning with a better-known “anchor” and then adjusting it; for example, asked to estimate how many hours his classmate studies in a week, a law student may first estimate how much he himself studies and then adjust that number up or down. Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, 185 SCIENCE 1124 (1974).

of adjudication.⁶ This article differs in its focus on a more explicit and thus more easily identifiable form of reasoning, where tropes for novel technology or expert evidence are deliberately selected and applied at various stages of trial. Analogical reasoning, while enabling those without technical expertise to better comprehend novel scientific evidence, undermines the objectivity of judges and jurors attempting to assess the admissibility or weight of such evidence. Although analogy may explain and demystify novel evidence and render scientific innovation ostensibly more accessible, such a rhetorical approach lends itself too well to manipulation and serves to mask new forms of evidence in the guise of older forms, piggy-backing on the authority and status of the more familiar models.

The common law shift from *Frye*⁷ to *Daubert*,⁸ reflected in changes to the Federal Rules of Evidence⁹ and codified by many states' own standards, shifted the burden of assessing the admissibility of new scientific and technological innovation from experts to judges. Where *Frye* evaluates technological evidence based on its general acceptance among scientists in the relevant field, *Daubert* asks judges to act as impartial gatekeepers¹⁰ by

⁶ See, e.g., Beecher-Monas, *supra* note 6; Chris Guthrie *et al.*, *Inside the Judicial Mind: Heuristics and Biases*, 86 CORNELL L. REV. 777 (2001); Daniel A. Krauss & Bruce D. Sales, *The Effects of Clinical and Scientific Expert Testimony on Juror Decision Making in Capital Sentencing*, 7 PSYCHOL. PUB. PO'Y. & L. 267 (2001); Gregory N. Mandel, *Technology Wars: The Failure of Democratic Discourse*, 11 MICH. TELECOMM. TECH. L. REV. 117 (2005); Michael L. Perlin, *Morality and Pretextuality, Psychiatry and Law: Of "Ordinary Common Sense," Heuristic Reasoning, and Cognitive Dissonance*, 19 BULL. AM. ACAD. PSYCHOL. & L. 131 (1991); D. Michael Risinger & Jeffrey L. Loop, *Three Card Monte, Monty Hall, Modus Operandi and "Offender Profiling": Some Lessons of Modern Cognitive Science for the Law of Evidence*, 24 CARDOZO L. REV. 193 (2002); Michael J. Saks & Robert F. Kidd, *Human Information Processing and Adjudication: Trial by Heuristics*, 15 LAW & SOC. REV. 123 (1981). For a review of research on juries and the effects of cognitive illusions on adjudication, see Robert J. MacCoun, *Experimental Research on Jury Decision-Making*, 244 SCIENCE 1046 (1989).

⁷ *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923) (holding systolic blood pressure deception test had not gained sufficient acceptance among scientists in the relevant field to be admissible). Courts followed *Frye*'s "general acceptance" standard for over seventy years. *Frye* held that "while courts will go a long way in admitting expert testimony deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained general acceptance in the particular field in which it belongs." *Id.* at 1014.

⁸ *Daubert v. Merrell Dow Pharma., Inc.*, 509 U.S. 579 (1993). See discussion *infra* Section II.

⁹ FED. R. EVID. 702.

¹⁰ The Court in *United States v. Mitchell* notes:

[T]he court is often referred to as a "gatekeeper." This metaphor is particularly apt because it works two ways: On the one hand, the court must exclude some evidence as a gatekeeper, by "preventing opinion testimony that does not meet the requirements of qualification, reliability and fit from reaching the jury." But on the other hand, the court is *only* a gatekeeper, and a gatekeeper alone does not protect the castle; as we have

applying suggested criteria to the evidence in question and using their discretion to determine the evidence's admissibility. In order to properly fulfill her role, the judge must seek to understand and assess the validity of scientific evidence on its own terms rather than relying on conventional wisdom and cognitive shortcuts.¹¹ She must also use her authority to shape how the jury is led to understand that evidence. In both her initial assessment and her subsequent instructions guiding jurors to their own conclusions, the judge must remain attuned to attempts by experts, attorneys, and the press to steer decision-makers away from direct and deliberate analysis and toward comparison of the new form of evidence to some other, better-known form, capitalizing on the familiar evidence's credibility and perceived validity (or lack thereof).¹²

Brain Fingerprinting technology is just beginning to garner legal attention as a viable form of scientific proof in criminal trials. While the CIA and FBI already rely on Brain Fingerprinting, it has yet to gain full entrée into the courtroom. Because its status is still uncertain, it provides fertile ground for evaluation of various modes of rhetorical presentation and discussion as we watch its courtroom and cultural reception in a "post-Daubert, post-DNA world."¹³ With striking frequency, journal articles, newspapers, television coverage, trial transcripts, and scientific publications

explained, "[a] party confronted with an adverse expert witness who has sufficient, though perhaps not overwhelming, facts and assumptions as the basis for his opinion can highlight those weaknesses through effective cross-examination." (internal citations omitted.)

United States v. Mitchell, 365 F.3d 215, 245 (3d Cir. 2003).

¹¹ For evidence that judges' decisions are often guided by heuristics and cognitive illusions that can lead to systematic errors in judgment, see Chris Guthrie *et al.*, *Inside the Judicial Mind*, 86 CORNELL L. REV. 777, 816, 819 (reporting empirical study testing for the influence of five common cognitive illusions in decisionmaking by a sample of 167 judges, and finding that "judges rely on cognitive processes that are likely to induce them to make systematic errors," especially anchoring, hindsight bias, and egocentric bias).

¹² Comparing a new form of evidence to an older form may work to distinguish and disparage it as effectively as it serves to justify and defend it. See, e.g., Clive A. Stafford Smith & Patrick D. Goodman, *Forensic Hair Comparison Analysis: Nineteenth Century Science or Twentieth Century Snake Oil?*, 27 COLUM. HUM. RTS. L. REV. 227 (1996) (comparing pubic hair identification with fingerprint identification repeatedly to highlight the former's shortcomings). "[H]air comparisons, unlike fingerprints, may not be used for positive identification." *Id.* at 231 n.8. "[I]t will be next to impossible to develop a 'bank' of features of potential suspects which could be used to identify potential suspects in a case (as may be done with fingerprints)." *Id.* at 241 n.59. "[I]t's not a fingerprint, but it's normally a strong association," *Id.* at 259 n.128 (citing *State v. Magouirk*, 539 So. 2d 50, 61 (La. Ct. App. 1989)). "Although probability standards for fingerprint and serology evidence have been established and recognized by the courts, no such standards exist for human hair identification," *Id.* at 287 n.250 (citing *Williamson v. Reynolds*, 904 F. Supp. 1529, 1556-58 (E.D. Okla. 1995)). "[U]nlike fingerprints, however, comparative microscopy of hair is not accepted as reliable evidence to positively identify a person." *Id.* at 229 n.4 (citing *State v. Faircloth*, 394 S.E.2d 198, 202 (N.C. Ct. App. 1990)).

¹³ Paul C. Gianelli, *Ake v. Oklahoma: The Right to Expert Assistance in a Post-Daubert, Post-DNA World*, 89 CORNELL L. REV. 1305 (2004).

characterize Brain Fingerprinting by analogy.¹⁴ This article attempts to unravel and destabilize those analogies, and evidentiary analogy generally, by drawing explicit attention to analogy as artificial construct. The analysis raises questions about who employs these classificatory techniques and why, how conscious or unconscious such processes may be, and how they impact laymen and judges. Most importantly, this article uses Brain Fingerprinting as a case study to demonstrate that any single analogy crafted to render less complex and more familiar a new and complicated form of evidence is necessarily destructive and can hinder our attempts at a true understanding of that evidence, trumping whatever usefulness the analogy provides. As such, it is incumbent upon us to monitor evidentiary analogies, exposing them to their target audiences and debunking the ways in which they are inapplicable, reductive, or excessively ambitious. While analogical reasoning may be deeply embedded in the legal process, judges must reduce and unsettle such categorizations of new evidence¹⁵ in order to achieve the objectivity required by *Daubert* and avoid replacing a courtroom model of dueling experts with a less obvious but equally confusing set of dueling analogies.

¹⁴ The exchange between the judge in the *Harrington* case (discussed further *infra*) and Farwell as expert witness for the Defendant typifies the role analogy plays in almost all discussions of Brain Fingerprinting:

Q Now, probably you have had lots of people that want to draw an analogy between your brain fingerprinting test and a polygraph. Is what you are doing telling whether or not somebody is lying?

A No, it is not; has nothing to do with whether they are lying or not. In fact, you get the exact same results with brain fingerprinting whether the person is lying or telling the truth.

Q How is that?

A We are just detecting whether the information is there in their brain. It's as if -- Say the DNA, they have DNA from a crime scene and on the person of the suspect, or you have fingerprints at the crime scene, you have fingerprints on the fingers of the suspect. If those match, it doesn't matter what he says about it. What we are doing is detecting a match, or no match, between information stored in the brain and information that we get from the crime scene, or relevant to the crime. If it matches, it matches. If it doesn't, it doesn't; has nothing to do with what the person says.

Transcript of Record at 14-15, *Harrington v. State*, 659 N.W.2d 509 (2003) (on file with the author) [hereinafter *Harrington* Transcript].

¹⁵ The board game "Taboo" (Hasbro) provides a concrete example of navigating around associations and categorizations to define a given term. In it, players pick a card with a keyword they must communicate to teammates, but each card also includes a list of taboo words that the player is not allowed to say. For example, a player may have to communicate "Boston" without saying "Red Sox," "Massachusetts," "city," "T," or "Harvard." If she utters one of the forbidden words, a player from the other team sounds a buzzer and her team is penalized. Buzzers sounding in the courtroom with any use of judicial analogy would be ludicrous, but the game provides a suggestive parallel for those situations when analogy seems inevitable or necessary.

I. JUDICIAL GATEKEEPING FROM *Frye* TO *Daubert*

Prior to 1993, Rule 702 of the Federal Rules of Evidence was primarily construed under *Frye* as holding scientific expert evidence to a standard of “general acceptance” within the field,¹⁶ placing significant responsibility on scientists within a relevant specialty to evaluate a given form of evidence. In 1993, the Supreme Court ruled in *Daubert* that expert evidence should be evaluated according to a number of criteria,¹⁷ and consequently Rule 702 was updated to reflect the holding.¹⁸ Those criteria include, but are not limited to, (1) whether the expert's methodology can be and has been tested; (2) whether the methodology has been published and subjected to peer review; (3) the method's known or potential rate of error and the existence and maintenance of standards controlling its operation; and (4) whether the methodology or principle is generally accepted in its field.¹⁹ The *Daubert* decision emphasizes the malleability of its guidelines, explaining that each criterion is “not a *sine qua non* of admissibility” and that “the inquiry envisioned [is] a flexible one.”²⁰ The decision “do[es] not presume to set out a definitive checklist or test,” only “some general observations.”²¹ Currently, states fall into one of three groups, with roughly a third each following *Daubert*, *Frye*, or a test of the state's own design, typically *Frye*-plus.²²

The Supreme Court's decision in *Daubert* marked an attempt to leave behind the dueling experts, a performance that often compels a jury faced with novel and complicated scientific evidence to act in accordance with the advice of the expert it trusts most or likes best.²³ The *Daubert*

¹⁶ *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

¹⁷ *Daubert v. Merrell Dow Pharma., Inc.*, 509 U.S. 579, 593-94 (1993).

¹⁸ FED. R. EVID. 702.

¹⁹ *Daubert*, 509 U.S. at 593.

²⁰ *Id.* at 594-95.

²¹ *Id.* at 593.

²² T. O'Connor, *Admissibility of Scientific Evidence Under Daubert*, MegaLinks in Criminal Justice, <http://faculty.ncwc.edu/toconnor/425/425lect02.htm> (last updated Feb. 5, 2006).

²³ Richard D. Friedman, “E” Is for Eclectic: Multiple Perspectives on Evidence, 87 VA. L. REV. 2029, 2050 (2001) (“If *Daubert* and the recent amendments were taken seriously, there would be no room for a ‘battle of the experts’”); Clifton T. Hutchinson & Danny S. Ashby, *Daubert v. Merrell Dow Pharmaceuticals, Inc.: Redefining the Bases for Admissibility of Expert Scientific Testimony*, 15 CARDOZO L. REV. 1875, 1877 (2004) (arguing that “while no theory of admissibility of scientific testimony can eliminate all ‘battles of the experts,’ *Daubert* provides a workable framework for limiting the battle to disputes in which the application of well-founded contested theories reasonably may lead to different conclusions.”); Edward J. Imwinkelried, *Proving the Case: The Science of DNA: The Case Against Evidentiary Admissibility Standards That Attempt to ‘Freeze’ the State of a Scientific Technique*, 67 U. COLO. L. REV. 887, 901-02 (1996); Kimberly S. Keller, *Bridging the Analytical Gap: The Gammill Alternative to Overcoming Robinson & Havner Challenges to Expert Testimony*, 33 ST. MARY'S L. J. 277, 290 (2002); Robert D. Leinbach, *Novel Scientific Evidence After Reese v. Stroh: The Washington Supreme*

standard also paved the way for new forms of evidence that have yet to gain the general acceptance *Frye* requires;²⁴ at the time of the ruling, DNA typified such valid but controversial scientific proof.²⁵ *Daubert* lessened the evaluative responsibility on lawyers, jurors, and experts and shifted the bulk of that burden onto the judiciary, expanding judges' gatekeeping role and requiring pre-trial *Daubert* hearings to determine the admissibility of expert testimony before presenting it to jurors. Under *Daubert*, the judge evaluates the evidence's relevance and reliability, and *Frye*'s general acceptance

Court's Love Affair with Frye, 71 WASH. L. REV. 1127, 1154 n.200 (1996); Victor E. Schwartz & Cary Silverman, *The Draining of Daubert & the Recidivism of Junk Science in Federal & State Courts*, 35 HOFSTRA L. REV. 217, 221 (2006) (describing trials under *Frye* as "a battle of purported experts without regard to the soundness of the evidence"); Sonia Sotomayor & Nicole A. Gordon, *Returning Majesty To The Law and Politics: A Modern Approach*, 30 SUFFOLK U. L. REV. 35, 44-45 (1996) (identifying *Daubert* as the Supreme Court's "reaction" to the battling experts problem); Richard T. Stilwell, *Kumho Tire: The Battle of the Experts Continues*, 19 REV. LITIG. 193, 231 (2000) (noting that *Kumho Tire*, which extended the principles of *Daubert* to apply to not just scientific expert testimony but all expert testimony, may help "level the playing field" and better control the impact of expert testimony in a "battle of experts."); Alan W. Tamarelli, Jr., *Daubert v. Merrell Dow Pharmaceuticals: Pushing the Limits of Scientific Reliability - The Questionable Wisdom of Abandoning the Peer Review Standard for Admitting Expert Testimony*, 47 VAND. L. REV. 1175, 1197 (1994) ("*Daubert*'s new flexible inquiry may be the only way to control today's proliferation of the battle of the expert."); James M. Wood & John E. Carne, *Daubert's Lamppost: A Guide to the Admissibility of Scientific Evidence*, 2 J. PHARMACY & LAW 221, 227 (1993) ("[T]he *Daubert* majority makes it plain that the... 'let the jury decide the battle of the experts' judicial abnegation seen [earlier]... is not the law."); cf. Sofia Adroque & Alan Ratliff, *The Care and Feeding of Experts: Accountants, Lawyers, Investment Bankers, and Other Non-Scientific Experts*, 47 S. TEX. L. REV. 881, 908 (2006) (arguing that the "battle of the experts" has not been simplified by post-*Daubert* jurisprudence); Sofia Adroque & Alan Ratliff, *The Independent Expert Evolution: From the "Path of Least Resistance" to the "Road less Traveled?"* 34 TEX. TECH. L. REV. 843, 873 (2003) (arguing that not only was the "battle of experts" not simplified in post-*Daubert* jurisprudence, it "arguably... has evolved into a complex expert crisis."); Shubha Ghosh, *Fragmenting Knowledge, Misconstruing Rule 702: How Lower Courts Have Resolved the Problem of Technical and Other Specialized Knowledge in Daubert v. Merrell Dow Pharmaceuticals, Inc.* 1 CHI.-KENT J. INTELL. PROP. 1, 11 (1999) (arguing that *Frye* led to a battle of experts that was not mitigated by *Daubert*.); Shubha Ghosh, *Methods, Conclusions, and the Search for Scientific Validity in Economics and Other Social Sciences*, 8 NAT. ITAL. AM. BAR ASS. DIGEST 1, 2 (2000) (noting the same "typical" wisdom that the move from *Frye* to *Daubert* addressed problems with the *Frye* standard, including concerns about the excessive weight of the battle between experts whose terms were often lost on a jury; conceding that *Daubert* may have equipped judges to be "better-armed referees" in such battles.); C. Robert Showalter, *Distinguishing Science from Pseudo-Science in Psychiatry: Expert Testimony in the Post-Daubert Era*, 2 VA. J. SOC. POL'Y & L. 211, 228 (1995) (predicting *Daubert* will only intensify the battle of the experts).

²⁴ Imwinkelried, *supra* note 24, at 901 ("One of the foremost criticisms of the former *Frye* rule was that it built in an undesirable lag time between the validation of a scientific technique in the laboratory and its admissibility in the courtroom"); David G. Owen, *A Decade of Daubert*, 80 DENV. U.L. REV. 345, 354 (2002).

²⁵ William C. Thompson, *Evaluating the Admissibility of New Genetic Identification Tests: Lessons from the "DNA War,"* 84 J. CRIM. L. & CRIMINOLOGY 22, 31-2 (1993).

standard becomes just one in a set of criteria that are considered but not required. Yet while *Daubert* appeased some, it irked others, since judges may be asked to assess innovative forms of evidence while lacking the technical knowledge to understand the science that underlies them. Likewise, while many criticize dueling experts' lack of impartiality, others object that state judges who are elected rather than appointed may be biased or motivated to protect their popularity when ruling on whether to admit some novel form of evidence.²⁶

II. THE ANALOGICAL FAMILY: METAPHOR, PROTOTYPE, ANALOGY

A. METAPHOR: "IMAGINARY GARDENS WITH REAL TOADS IN THEM"

Marianne Moore, decrying her objections to poetry ("I, too, dislike it") in "Poetry," nonetheless finds in it "a place for the genuine" where poets "can present/ for inspection, imaginary gardens with real toads in them."²⁷ Metaphor plays a crucial role in both poetry and law, and Moore's "real toads" capture the kernel of truth that successful metaphor affords us.

Yet while the trouble created by an inapt metaphor in a poorly written poem²⁸ may frustrate artists and aesthetes, inapt or misapplied metaphor in the legal realm may prove dangerous on a more immediate level. Bosmajian's work on metaphor in judicial opinions focuses on tropes that began in one Supreme Court opinion and slowly became institutions unto themselves.²⁹ The metaphors he discusses were, once uttered, reiterated by judges, journals, lawmakers, professors, and the population at large, until they came to be regarded as not merely principle and doctrine, but "central tenets."³⁰ Metaphors like "marketplace of ideas," "schoolhouse gates," "wall of separation," and "chilling effect" have become irreversibly integrated into legal doctrine as though they supplied an objective account of the situation, rather than one man's insight cloaked in metaphor.³¹ Burr Henly's treatment of "penumbra"³² and Steven Winter's analysis of the

²⁷ For some discussion of the "kudos," "consternation," and "criticism" that followed *Daubert*, see Erica Beecher-Monas, *Blinded by Science: How Judges Avoid the Science in Scientific Evidence*, 71 TEMP. L. REV. 55, 55 (1998).

²⁸ MARIANNE MOORE, *Poetry*, in POEMS 135, 135 (1921).

²⁹ Or, just as problematically, a brilliant metaphor injected into the wrong poem.

³⁰ HAIG BOSMAJIAN, *METAPHOR AND REASON IN JUDICIAL OPINIONS* (1992).

³¹ *Id.* at 3.

³² *Id.* Bosmajian devotes a chapter apiece to each of those four metaphors, as well as "captive audience," the set of tropes that describe speech in terms of fire, and the personifications of justice, the constitution, and judicial opinions.

³³ Burr Henly, "Penumbra": *The Roots of a Legal Metaphor*, 15 HASTINGS CONST. L. Q. 81 (1987).

metaphor of “standing”³³ similarly foreground judicial reliance on metaphor and mine the metaphors themselves to deconstruct their effects.

Metaphor refers to the welding together of two things not typically associated with one another in order to convey attributes of the one that are integral to the other, so that love is a rose, or a poem “an imaginary garden with real toads” in it. Some metaphors are so contrived or challenging as to leave us wondering what the two things compared have in common that sparked their comparison, like Moore’s garden; others are so rich that we may continually discover new ways to understand what the object of the metaphor suggests about the subject, like the common ground of love and rose; still others are so familiar that they present themselves as scarcely metaphors at all, such as clichés like “time flies,” familiar descriptors like “ponytail,” or conceptual metaphors embedded in language, like those treating the mind as a container or passionate love as fire. All of these functions of metaphor play out in legal metaphor, and often to detrimental effect.

In the courtroom, countless forms of evidence have relied on fingerprint as metaphor in order to capitalize on fingerprint’s status and appropriate its authority. Thus while footprints and palm prints do provide an analogous “print” and warrant the semantic overlap,³⁴ neither voice spectrography nor DNA analysis properly earns the titles of “voice printing”³⁵ and “DNA fingerprinting”³⁶ that advocates cleverly sought to

³³ Steven L. Winter, *The Metaphor of Standing and the Problem of Self-Governance*, 40 STAN. L. REV. 1371, 1383 (1988).

³⁴ I refer to the obvious fact that all three incorporate the word “print,” though prints of non-fingers have been held not merely analogous but synonymous in process, role, and reliability. See, e.g., *United States v. Mitchell*, 365 F.3d 215, 221 (3d Cir. 2003) (“[T]oeprint or handprint analysis is much the same as fingerprint analysis”).

³⁵ See, e.g., *Commonwealth v. Topa*, 369 A.2d 1277, 1278 (Pa. 1977); *United States v. Williams*, 583 F.2d 1194, 1197 n.5 (2d Cir. 1978) (noting, “A spectrogram has been often called a ‘voiceprint.’ We avoid the term as potentially leading to an unwarranted association with fingerprint evidence.”); Carlton Bailey, *The Admissibility of “Novel Scientific Evidence” in Arkansas: Does Frye Matter?*, 52 ARK. L. REV. 671, 688 (1999); Beecher-Monas, *supra* note 27, 71 TEMP. L. REV. 55, 57 (1998); Bert Black, *A Unified Theory of Scientific Evidence*, 56 FORDHAM L. REV. 595, 607 (1988); Thomas L. Bohan, *Scientific Evidence and Forensic Science Since Daubert: Maine Decides to Sit out the Dance*, 56 ME. L. REV. 101, 105 (2004); Andrew Lustigman, *A New Look at Thermography’s Place in the Courtroom: A Reconciliation of the Conflicting Evidentiary Rules*, 40 AM. U.L. REV. 419, 433 (1990); Lawrence M. Solan & Peter M. Tiersma, *Hearing Voices: Speaker Identification in Court*, 54 HASTINGS L.J. 373, 375 (2003).

³⁶ See, e.g., C. Thomas Blair, *Spencer v. Commonwealth and Recent Developments in the Admissibility of DNA Fingerprint Evidence*, 76 VA. L. REV. 853 (1990); Alan R. Davis, *Are You My Mother? The Scientific and Legal Validity of Conventional Blood Testing and DNA Fingerprinting to Establish Proof of Parentage in Immigration Cases*, 1994 B.Y.U.L. REV. 129 (1994); Jonathan Greenberg, *DNA Fingerprinting: A Guide for Defense Counsel*, 1989 ARMY LAW. 16; Jane E. Hanner, *DNA Fingerprinting: Evidence of the Future*, 79 KY. L.J. 415 (1991); Robert R. Long, Jr., *The DNA “Fingerprint”: A Guide to Admissibility*, 1988 ARMY LAW. 36; Jeffrey Norman, *DNA Fingerprinting: Is It Ready for*

assign them. Neither voice recordings nor DNA strands leave a mark or impression behind at a crime scene. Labeling them “prints” exploits similarities each may share with the role or process of fingerprint identification and fashion those similarities into an overall sense of sameness.

Stephanie Gore’s exploration of Internet metaphors proves telling.³⁷ Examining tropes used to understand and legislate issues related to “emerging technologies” like computer hardware, software, semiconductors, and cable systems,³⁸ she initially sets out to advocate for an objective understanding of these technologies, asking “[w]hy pick an analogy to begin with?...[W]hy shouldn't courts simply make the effort to understand the technological underpinnings of the Internet and achieve a ‘metaphor-free’ understanding of the technology?”³⁹ but ultimately rejects that goal as impossible.⁴⁰ Gore surveys some of the metaphors and analogies applied to computers:⁴¹ Various high court decisions have compared a hard drive with “closed containers”⁴² or “dressers or file cabinets”;⁴³ a computer file with “books, magazines, periodicals, films, and video tapes”;⁴⁴ the Internet with telephone,⁴⁵ newspaper,⁴⁶ television,⁴⁷ and “a free pass into the equivalent of every adult bookstore and video store.”⁴⁸

Gore notes some of the dangers of allowing metaphor to dominate conversations about technology:

Trial? 45 U. MIAMI L. REV. 243 (1990); James P. O’Brien, Jr., *DNA Fingerprinting: The Virginia Approach*, 35 WM. AND MARY L. REV. 767 (1994); Sally E. Renskers, *Trial By Certainty: Implications of Genetic ‘DNA Fingerprints’*, 39 EMORY L.J. 309 (1990); Michael J. Short, *Forensic DNA Analysis: An Examination of Common Objections Raised to the Admission of DNA Fingerprinting as Illustrated by State v. Pierce*, 19 DAYTON L. REV. 133 (1993); Lee Thaggard, *DNA Fingerprinting: Overview of the Impact of the Genetic Witness on the American System of Criminal Justice*, 61 MISS. L.J. 423 (1991).

³⁷ Stephanie Gore, *A Rose by Any Other Name: Judicial Use of Metaphors for New Technologies*, 2003 U. Ill. J.L. Tech. & Pol’y 403.

³⁸ *Id.* at 408.

³⁹ *Id.* at 438.

⁴⁰ *Id.* at 409-10.

⁴¹ Gore focuses primarily on the issue of the minimum contacts required for personal jurisdiction as applied to web transactions.

⁴² *Id.* at 418 (citing *United States v. Carey*, 172 F.3d 1268, 1275 (10th Cir. 1999)).

⁴³ *Id.* at 417 (citing *United States v. Walser*, 275 F.3d 981, 986 (10th Cir. 2001)).

⁴⁴ *Id.* at 418 (citing *United States v. Thompson*, 281 F.3d 1088, 1091 (10th Cir. 2002)).

⁴⁵ *Id.* at 424 (citing Transcript of Oral Argument at 30-31, *Reno v. ACLU*, 521 U.S. 844 (1997) (No. 96-511), in 1997 WL 136253 (Mar. 19, 1997)).

⁴⁶ *Id.* at 423 (citing *ACLU v. Reno*, 929 F. Supp. 824, 883 (E.D. Pa. 1996) (Dalzell, J., concurring)).

⁴⁷ This analogy was asserted by the government and feared by the prosecution in *ACLU*, but not adopted by judges. *Id.* at 422-23 (citing *ACLU v. Reno*, 929 F. Supp. 824, 881 (E.D. Pa. 1996), *aff’d*, 521 U.S. 844).

⁴⁸ *Id.* at 421. (citing Transcript of Oral Argument at 4, *Reno v. ACLU*, 521 U.S. 844 (1997) (No. 96-511)).

First, concerns have been raised regarding the judiciary's ability to understand complex technology. Second, fear is a powerful barrier to learning, and fear of technology is a common phenomenon. Third, metaphors can be seductive, and may lead a person to end efforts to understand a new (perhaps daunting) concept too quickly. Finally, metaphors play a particularly powerful role in the law, since a court may inherit as precedent metaphors chosen by another court....All of this leads to the potential for the creation of precedents in which courts substitute poorly fitting metaphors for true comprehension of the technology at issue.⁴⁹

Despite widespread attempts to metaphorize the Internet, many Internet users concur that, when applying existing law to cyberspace, "old analogies just don't cut it."⁵⁰ One user, objecting to analogizing computer account break-ins to real property break-ins, locates the problem in "applying analogies from the everyday world in the first place. Things are different enough in Cyberia that our customary paradigms frequently don't fit....We may just need new rules."⁵¹

B. PROTOTYPE: SOME TOADS MORE "TOAD" THAN OTHER TOADS

The prototype theory of classification holds that categories are typically not black-and-white, but are founded upon stereotypes, fuzzy boundaries, and resemblances. Categories are not explicable merely by reference to similar characteristics; rather, judgments of similarity depend on properties, relations, and categories already learned.⁵² Notably, Eleanor Rosch's work on representativeness documented how, rather than considering all members of a category to serve as equally valid examples of that category, speakers differentiate between good and bad examples of a certain category, or "central" and "non-central" members. While the classical theory regarded membership in categories as uniform, so that a given amphibian is either a toad or not but no toad is any more "toad" than any other toad, the modern theory acknowledges that when faced with an albino toad or a toad missing a leg, we may acknowledge its full

⁴⁹ *Id.* at 403.

⁵⁰ I. Trotter Hardy, *The Proper Legal Regime for "Cyberspace,"* 55 U. PITT. L. REV. 993, 994 (1994). Hardy conducted an electronic conference over the Internet on whether cyberspace should be treated as a separate jurisdiction; his article includes insightful quotes from participants frustrated with the legal world's attempts to assimilate the circumstances and rules of Cyberspace using the extant rules and laws of meatspace.

⁵¹ *Id.*

⁵² Stuart P. Green, *Prototype Theory and the Classification of Offenses in a Revised Model Penal Code: A General Approach to the Special Part,* 4 BUFF. CRIM. L. REV. 301, 306 (2000).

membership in the category “toad” while simultaneously considering it a less representative and thus less useful example of a toad.⁵³

Several theorists have applied prototype theory in their pursuit to better understand jurors’ decision-making processes. They have discovered that individuals enter a jury box not with the *tabulae rasae* the law assumes, but with “stereotypes of offenders,”⁵⁴ “prototypes of offenses,”⁵⁵ “case-relevant attitudes,”⁵⁶ and “knowledge about everyday events”⁵⁷ that affect their conclusions.⁵⁸ Vicki Smith found that laypeople possess naïve concepts of crimes that they organize by prototype, not by necessary and sufficient elements.⁵⁹ Juries faced with “burglars” and “rapists” who fit squarely within their preconceived categories of “burglar” and “rapist,” central members rather than outliers made faster and more predictable decisions. Regardless of statutory definition or charge from the judge, jurors have more trouble with non-central examples of perpetrators or victims, as in acquaintance rape cases without force, where the “best” example of rape might be stranger rape involving a weapon.⁶⁰ Stuart Green applies cognitive

⁵³ Rosch uses other examples: A bed is a better example of furniture than is a clock; a robin is a better example of a bird than is an ostrich; a German Shephard is a better example of a dog than is a Pekinese. Eleanor Rosch, *Cognitive Representations of Semantic Categories*, 104 J. EXPERIMENTAL PSYCHOL. 192, 229, 232, 198 (1975). Fillmore offers George Stephanopoulos as a better example of “bachelor” than the pope, although both fit the definition. Charles Fillmore, *Towards a Descriptive Framework for Spatial Deixis*, in SPEECH, PLACE, AND ACTION: STUDIES IN DEIXIS AND RELATED TOPICS 31 (Robert J. Jarvella & Wolfgang Klein eds., 1982).

⁵⁴ Jennifer L. Skeem & Stephen L. Golding, *Describing Jurors' Personal Conceptions of Insanity and Their Relationship to Case Judgments*, 7 PSYCHOL. PUB. POL’Y. & L. 561, 561 (2001) (citing L. Stalans, *Citizens' Crime Stereotypes, Biased Recall and Punishment Preferences in Abstract Cases: The Educative Role of Interpersonal Sources*, 17 LAW & HUM. BEHAV. 451 (1993)).

⁵⁵ *Id.* (citing Vicki Smith, *When Prior Knowledge and Law Collide: Helping Jurors Use the Law*, 17 LAW & HUM. BEHAV. 507 (1993)).

⁵⁶ *Id.* (citing G. Moran, B. Cutler, & A. DeLisa, *Attitudes Toward Tort Reform, Scientific Jury Selection, and Juror Bias: Verdict Inclination in Criminal and Civil Trials*, 18 LAW & PSYCH. REV. 309 (1994)).

⁵⁷ *Id.* (citing W. BENNETT & M. FELDMAN, *RECONSTRUCTING REALITY IN THE COURTROOM: JUSTICE AND JUDGMENT IN AMERICAN CULTURE* (1981); N. Pennington & R. Hastie, *Evidence Evaluation in Complex Decision Making*, 51 J. PERSONALITY & SOCIAL PSYCHOL. 242 (1986)).

⁵⁸ *Id.* (citing S. Gross, *Overruled: Jury Neutrality in Capital Cases*, 21 STAN. L. REV. 11 (1986); S. Adler, *Shadow Juries Tip the Balance*, WALL ST. J., Oct. 24, 1989, at B7; S. Adler, *Rigged Juries?*, ATLANTA J., Nov. 27, 1994, at D1; W. Lambert, *Jury Consultants Lose Mystique as Firms Tighten their Belts*, WALL ST. J., Feb. 4, 1994, at B7.)

⁵⁹ Vicki L. Smith, *When Prior Knowledge and Law Collide: Helping Jurors Use the Law*, 17 LAW & HUM. BEHAV. 507 (1993).

⁶⁰ See MARTHA CHAMALLAS, *INTRODUCTION TO FEMINIST LEGAL THEORY* 222-36 (1999) (discussing prototypes of rape). Marge Piercy’s poem “the gray flannel sexual harassment suit” alludes to the difficulties faced by a victim of harassment who does not present as a central member of the victim category, i.e. chaste, white, Christian, upper-class, attractive, etc., concluding that a woman other than that described in the poem

scientists' understanding of the importance of prototypes to the model penal code to suggest revisions.⁶¹ Neal Feigenson examines jurors' reliance on prototypes and other heuristics and explores how such cognitive models shape jurors' assessment of responsibility in accidents, as well as how attorneys cater to and manipulate those prototypes in their arguments.⁶² Skeem and Golding determined three prototypes for insanity and found that the one to which a juror subscribes predicts the way he will interpret and judge an insanity case.⁶³ Lawrence Solan uses categorization problems as examples when he highlights the way so many cases rest on the interpretation of a single word:⁶⁴ "Does a minister's work count as 'labor'?"⁶⁵ [S]hould an airplane... count[] as a 'vehicle' for purposes of a federal statute outlawing the transportation of stolen vehicles across state lines?⁶⁶ Has one 'used a firearm' when one has traded a gun for cocaine?"⁶⁷

Few have devoted equal attention to the process by which jurors make sense of and attorneys explain evidence, perhaps because social heuristics strike theorists as more determinative of decisions than nonsocial ones. But if jurors' naïve conceptions of criminals impact their assessments of guilt or innocence, naïve conceptions of categories of proof likely also impact how jurors assign weight to evidence they encounter at trial. Imagine a juror believes, for example, that a) polygraphs are completely unreliable; b) fingerprints cannot be faked; c) DNA is the best way for police officers to frame a suspect, and they regularly do; and d) expert testimony from social scientists is unscientific and merits little weight. The outcome of a trial might then rest on one question for that juror: Into which basket should he place the evidence before him?⁶⁸ The semantic tug-of-war surrounding the classification of Brain Fingerprinting and its depiction by members of the press suggests that many understand intuitively how prototype functions, and would gladly venture to answer our hypothetical

"simply cannot be harassed." MARGE PIERCY, WHAT ARE BIG GIRLS MADE OF? 41-43 (1997).

⁶¹ Stuart P. Green, *supra* note 53.

⁶² Neal R. Feigenson, *The Rhetoric of Torts: How Advocates Help Jurors Think About Causation, Reasonableness, and Responsibility*, 47 HASTINGS L.J. 61 (1995).

⁶³ Skeem & Goulding, *supra* note 55 at 584.

⁶⁴ Lawrence M. Solan, *Why Laws Work Pretty Well, but Not Great: Words and Rules in Legal Interpretation*, 26 LAW & SOC. INQUIRY 243, 244-45 (2001) (reviewing STEVEN PINKER, WORDS AND RULES: THE INGREDIENTS OF LANGUAGE (1999)).

⁶⁵ *Id.* at 244 (referring to *Church of the Holy Trinity v. United States*, 143 U.S. 457 (1892)).

⁶⁶ *Id.* at 245 (citing *McBoyle v. United States*, 283 U.S. 25 (1931)).

⁶⁷ *Id.* at 245 (citing *Smith v. United States*, 508 U.S. 223 (1993)).

⁶⁸ Mnookin raises another example of categorizing evidence, photographs as words vs. photographs as images, asking why judges didn't treat a photograph as "more like a deed than a diagram." She alludes to judges' inclination to value words over images in the courtroom, which might have motivated them to treat photographic evidence in a way that would preserve that hierarchy of proofs. Jennifer Mnookin, *The Image of Truth: Photographic Evidence and the Power of Analogy*, 10 YALE J.L. & HUMAN 1, 54 (1998).

basket question in the manner that best supports his ends. By naming one technology after another, or classifying one in terms of the other, experts and journalists seek not to lessen the effects of cognitive heuristics by making them explicit, but to capitalize on them by playing directly into them.

C. ANALOGY: TOAD, THE NEW CHIHUAHUA, OR TOAD, THE NEXT CAVIAR?

The dictionary defines analogy as a) a similarity between two things; b) any comparison based on that similarity; and c) a “form of logical inference or an instance of it, based on the assumption that if two things are known to be alike in some respects, then they must be alike in other respects.”⁶⁹ Analogy is closely related to metaphor and prototype, but the latter two may be easier to spot, making analogy sneakier and thus more insidious. Prototype asks, “does this toad belong in the group called ‘animals to play with and keep as pets’ or ‘animals to order in fancy restaurants?’” Analogy posits a simpler connection between one member of a category and another, based on resemblance: It tells you the proffered toad belongs in your fish tank with your turtle, or it tells you that toad, with a little butter sauce, is a delicacy superior even to escargot.

DNA evidence and its component pieces have been analogized to a wide spectrum of objects and processes, including blood samples,⁷⁰ hair analysis,⁷¹ fingerprint identification,⁷² a bar code,⁷³ a photograph,⁷⁴ a nut,⁷⁵ a building,⁷⁶ a business card,⁷⁷ baking a cake,⁷⁸ and the law of gravity.⁷⁹

⁶⁹ AMERICAN HERITAGE DICTIONARY (4th ed. 2004), *available at* <http://dictionary.reference.com/browse/analogy> (last visited Apr. 6, 2007).

⁷⁰ *United States v. Morrow*, 374 F.Supp.2d 51, 65 (D.D.C. 2005).

⁷¹ *Id.*

⁷² *See, e.g., United States v. Kincade*, 379 F.3d 813, 857 n.15 (9th Cir. 2004); *United States v. Kincad*, 345 F.3d 1095, 1000 (9th Cir. 2003); Jean L. Marx, *DNA Fingerprinting Takes the Witness Stand*, 240 SCIENCE 1616, 1616 (1988).

⁷³ Janet Hoeffel, Note, *The Dark Side of DNA Profiling: Unreliable Scientific Evidence Meets the Criminal Defendant*, 42 STAN. L. REV. 465, 474, 512 (1990).

⁷⁴ *Id.* at 513 (citing *Andrews v. State*, 533 So.2d 841 (Cir. Ct., Fla. 1988) (upholding for the first time that DNA typing evidence was admissible on appeal)).

⁷⁵ *Id.* at 512 (“You can think of DNA as kind of like a nut locked within a shell” (citing Record, at 420-21, *Andrews*, 533 So.2d 841 (reporting the direct testimony of Alan Giusti, Forensic Scientist, Lifecodes))).

⁷⁶ *Id.* at 512 (citing *Andrews*, 533 So.2d 841).

⁷⁷ Ricki Lewis, *DNA Fingerprints: Witness for the Prosecution*, DISCOVER, June 1988, at 44, 52 (quoting Dr. Michael Baird of Lifecodes, “If you’re a criminal, [leaving behind your DNA is] like leaving your name, address, and social security number at the scene of the crime”).

⁷⁸ Hoeffel, *supra* note 74 at 512 (“You can almost think of [DNA testing] like cooking, so a reagent would be butter or eggs or flour” citing Record, Vol. III, at 510, *Andrews*, 533 So.2d 841).

Federal judges have likened voice identification to blood samples,⁸⁰ urinalysis,⁸¹ handwriting exemplars,⁸² gunbarrel striations,⁸³ and fingerprints.⁸⁴ Polygraphy has been compared to DNA, handwriting, ballistics, toxicology, and fingerprint evidence;⁸⁵ fingerprints to DNA⁸⁶ and handwriting analysis;⁸⁷ handwriting analysis to fingerprint,⁸⁸ DNA,⁸⁹ and blood samples.⁹⁰ Scent⁹¹ and hair samples⁹² have been analogized to fingerprints.

Analogy is regarded as legal reasoning's "most characteristic way of proceeding,"⁹³ its dominance demonstrated endlessly in precedential decision-making, legislation, the case method, and the common law system. Analogy is thought inescapable in the realm of innovation, "the only real road map for courts when technological change leaves them in unknown legal territory."⁹⁴ Because navigating technological forms of evidence is as critical in some cases as understanding the litigation's scientific subject matter, the role of analogy in explaining and comprehending scientific evidence mandates close examination.

In his pre-*Daubert* work on Biotechnology and Law, Vincent Brannigan describes technico-legal revolutions as occurring "when a given technological advance cannot be clearly analogized to existing legal structures" and consisting of "a series of stages in the legal response to the

⁷⁹ *Id.* at 465 ("disputing the technology is like disputing the law of gravity" (citing Debra Cassens Moss, *DNA -- The New Fingerprints*, A.B.A. J., May 1, 1988, at 66, 69-70)).

⁸⁰ *United States v. Loyd*, 10 M.J. 172, 174 (U.S. Court of Military Appeals 1981).

⁸¹ *Nat'l Treasury Employees Union v. Von Raab*, 816 F.2d 170, 181 (5th Cir. 1987).

⁸² *Loyd*, 10 M.J. at 714; *United States v. Williams*, 583 F.2d 1194, 1199 (2d Cir. 1978); *United States v. Dioniso*, 410 U.S. 1, 3-4 (1973).

⁸³ *Williams*, 583 F.2d at 1199.

⁸⁴ *Dioniso*, 410 U.S. at 3-4.

⁸⁵ *United States v. Wilson*, 361 F. Supp. 510, 513 (D. Md. 1973).

⁸⁶ *United States v. Kincade*, 379 F.3d 813, 842 (9th Cir. 2004).

⁸⁷ *United States v. Martinez-Cintrón*, 136 F. Supp. 2d 17, 20 (D.P.R. 2001).

⁸⁸ *United States v. Crisp*, 324 F.3d 261, 271, 281 (4th Cir. 2003); *United States v. Jones*, 107 F.3d 1147, 1159 (6th Cir. 1997); *United States v. Prime*, 220 F. Supp. 2d 1203, 1207 (W.D. Wash. 2002); *Greenberg Gallery v. Bauman*, 817 F. Supp. 167, 172 n.5 (D.D.C. 1993).

⁸⁹ *United States v. Hines*, 55 F.Supp.2d 62, 69 (distinguishing handwriting analysis from DNA).

⁹⁰ *United States v. Loyd*, 10 M.J. 172, 174 (US Court of Military Appeals 1981).

⁹¹ *Goldstein v. Allstate*, 1998 U.S. Dist. LEXIS 18288, 4 (comparing the probative value of evidence from human-sniffing dogs to that from dogs trained to suss out ignitable liquids; disparaging the former by distinguishing it from fingerprints).

⁹² *United States v. Massey*, 549 F.2d 676, 13 (8th Cir. 1979) (describing hair samples as only slightly less reliable indicators of identity than fingerprints).

⁹³ Cass Sunstein, *On Analogical Reasoning*, 106 HARV. L. REV. 741, 741 (1993).

⁹⁴ Linda Greenhouse, *What Level of Protection for Internet Speech?*, N.Y. TIMES, Mar. 24, 1997, at D5.

novel developments in technology.”⁹⁵ He identifies four categories of such revolutions,⁹⁶ the fourth of which is evidentiary, and four distinct phases of the technico-legal revolution that occur in fixed order: “1) autonomy; 2) conflict; 3) determination; and 4) resolution.”⁹⁷ The four phases map onto technological⁹⁸ evidence in the following way: In the “autonomy” phase, the inventor uses the novel form of evidence in a legal proceeding; in the “conflict” phase, the opponent objects to the technological evidence and asserts his right to prevent its use; in the “determination” phase, experts duel; and at “resolution,” the judge determines the admissibility and the jury assesses the weight of the evidence.⁹⁹ “[F]alse analogy” often dominates the “conflict” and “determination” phases:

Since technico-legal revolutions are defined as situations in which no exact analogy is possible, the false analogy involves comparing some of the attributes of a new technology to those of a preexisting technology with a legal structure favorable to that party, while ignoring those which would lead to a different conclusion. The analogies are false in the sense that they are not exact as well as in the sense that the divergence from the prior situation is often overlooked or minimized.¹⁰⁰

Although Brannigan writes in the *Frye* era, his criticism that evidentiary analogy in the courtroom rings doubly false applies as well to judge and jurors’ analogy as it does to that of experts and attorneys, and as well to the first and fourth phase he describes as the second and third. Brannigan blames technological complexity, rather than manipulation, for spurring various players to create and present false analogies.¹⁰¹ Disappointingly, Brannigan later retreats from his aggressive claim that “no exact analogy is possible,” concluding with optimism that “[t]he concept of a technico-legal revolution can be used to put all the facts and claims into

⁹⁵ Vincent M. Brannigan, *Biotechnology and the Law: Biotechnology: A First-Order Technico-Legal Revolution*, 16 HOFSTRA L. REV. 545, 545 (1988).

⁹⁶ *Id.* at 550-51. The first three types of technico-legal revolution are proprietary rights, personal injury risk, and risk to other protected interests. *Id.* at 550-51. A “first-order” revolution spans more than one of the four categories, while a “second-order” revolution occurs only within a single category. *Id.* at 551.

⁹⁷ *Id.* at 553.

⁹⁸ The difference between technology and science is that “[s]cience essentially defines what we know, while technology defines what we can use.... [It] is the utility of the knowledge, not its exactness, that makes it usable as technology. [citation omitted.]” *Id.* at 547.

⁹⁹ *Id.* at 555.

¹⁰⁰ *Id.* at 556-57.

¹⁰¹ “Since the technological portion of the analogy is complex, there is a tendency to emphasize the technological similarities while ignoring the underlying factual differences.” *Id.* at 557.

proper perspective and provide proper past analogies to current technological developments.”¹⁰²

Brannigan uses a simplistic model to cover the “full range” of possible prior legal analogies, all of which he deems false because they fail to account for all of the technology’s attributes. If a given technico-legal revolution possesses three attributes [A, B, C], the target analogy may substitute a different attribute [A, B, X], elide an attribute [B, C], or add an extra attribute [A, B, C, Z].¹⁰³ While Brannigan’s model provides a useful jumping-off point, he fails to take into account the nuances false analogies necessarily convey. His model may suffice to show what elements are added, subtracted, or substituted in his example of extending a particular rule of law,¹⁰⁴ but it falls short in a discussion of evidentiary analogy. Most importantly, it neglects to explore the value judgments and stereotypes linked with each attribute of the target evidence or with the target’s overall cultural significance.¹⁰⁵ If a new and little-known form of technological evidence, such as thermography, is compared with a widely known form like DNA identification, supplanting [A, B, Th] with [A, B, D, N, A] may be the least of our worries. Analogy may lead a jury or judge with little exposure to thermography and extensive exposure to DNA to turn [A, B, Th] into [A, B, unknown, unpublicized, unfamiliar] comparing it not to the naked elements of DNA matching, but to a set of loose associations like [A, B, D, reliable, scientifically valid, well-established, incontrovertible, O.J. Simpson, crime lab, Nobel Prize]. Conversely, an opposing counsel allowed to compare thermography to tarot card fortune-telling [A, B, T] may do so to foreground a set of associations [unscientific, inadmissible, fraudulent, fake, entertainment] for the sheer purpose of discrediting the novel evidence. Brannigan can hope for future “proper analogies” because he is able to separate subject and target of the analogy into its objective elements, but perhaps the subjective elements exert an even stronger influence on evidentiary analogy’s audience.

What is a “proper analogy,” or when is analogy in legal reasoning both harmless and efficient? Hardy differentiates between legal problems that are “new” and those that are not, so that if a scenario in cyberspace truly presents no differences between it and the existing law applied to

¹⁰² *Id.* at 581.

¹⁰³ *Id.* at 557 n.42.

¹⁰⁴ Brannigan’s example is that of assigning responsibility for oil spills by extending the rule that shipowners needed insure their own cargoes but were immune from damages. *Id.* at 556.

¹⁰⁵ For example, ACLU’s Barry Steinhardt dismisses Brain Fingerprinting as “pure snake oil. ...It’s the 21st century version of the lie detector test, which also doesn’t work very well.” Steinhardt capitalizes on the value judgment associated with the objects of his analogy as a form of shorthand, instead of actually analyzing Brain Fingerprinting technology to understand how it differs from other forms of proof. TalkLeft.com, “*Brain Fingerprinting*” to Solve Crimes?, Feb. 11, 2003, http://talkleft.com/new_archives/001752.html.

comparable scenarios outside of the Internet, the law may be applied unproblematically to the scenario because it is not in fact “new,” and the law need not be complicated by adding to it:

Some of the legal problems of cyberspace are indistinguishable from those that arise in real space. For the most part, these situations are characterized by the use of cyberspace as merely another means of transmission from individuals directly to other individuals. Defamatory e-mail messages from “A” to “B” in regard to “C” are no different from defamatory letters or phone calls.¹⁰⁶

He identifies “[n]ewness” where “some sort of legal solution tailored to the cyberspace problem will bring clarity and predictability to the rules attending cyberspace conduct, the benefits of which outweigh the additional complexity thereby added to the legal system....”¹⁰⁷ For example, the question of how system administrators function in cyberspace, whether most like “bookstores,” “telephone companies,” “publishers,” or “like none of these,” is a problem Hardy considers “worth addressing.”¹⁰⁸ Analogy is thus inappropriate where “the underlying policy concerns of ‘real space’ law are inappropriate when applied to activities in cyberspace.”¹⁰⁹ Johnson and Marks draw a similar conclusion about the lack of any “proper” or “best” analogy for electronic data communications: “Since the inception of networked data communications systems, commentators have...map[ped] the systems against existing relationships in order to try to pick the ‘right’ metaphor. These attempts, however, presuppose...some ‘best fit,’ some metaphor that will accurately characterize all the activities involved in these systems.”¹¹⁰ Reviewing two books on the information age and copyright law, one critic wryly observes the prevalence of metaphor in Internet literature and the quest for the perfect metaphor:

Despite differences between the two books, they have at least one pervasive theme in common. Both authors are deeply concerned about the disabling consequences likely to attend hanging on to metaphors of the waning era. Both are in search of enabling metaphors suitable to the new era. Each has, of course, a different metaphor to offer as *bete noire*.¹¹¹

¹⁰⁶ I. Trotter Hardy, *The Proper Legal Regime for “Cyberspace,”* 55 U. PITT. L. REV. 993, 994 (1994).

¹⁰⁷ *Id.* at 1053.

¹⁰⁸ *Id.* at 1054.

¹⁰⁹ *Id.* at 1053.

¹¹⁰ David R. Johnson & Kevin A. Marks, *Mapping Electronic Data Communications onto Existing Legal Metaphors: Should We Let Our Conscience (and Our Contracts) Be Our Guide?* 38 VILL. L. REV. 487, 487 (1993) (citations omitted).

¹¹¹ Pamela Samuelson, *Law and Computers: The Quest for Enabling Metaphors for Law and Lawyering in the Information Age*, 94 MICH. L. REV. 2029, 2031 (1996)

Jennifer Mnookin's work on forensic evidence draws many connections among once-novel forms of evidence and the process by which each came to be considered admissible or even infallible. She notes that despite a number of challenges to fingerprint evidence in recent years¹¹² and the fact that fingerprint identification never passed any real empirical test to determine the validity of its claims,¹¹³ judges and petitioners often hold up fingerprint as the ultimate form of incontrovertible proof.¹¹⁴ While analogy from fingerprint to palm print or footprint evidence may be logical, if unqualified, Mnookin notes that justifying admission of tool mark identification by comparing it to fingerprint represents "an even greater analogical stretch."¹¹⁵ She cites a 1930 decision that epitomizes such a rhetorical move:

(reviewing JAMES BOYLE, *SHAMANS, SOFTWARE, AND SPLEENS: LAW AND THE CONSTRUCTION OF THE INFORMATION SOCIETY* (1996) and M. ETHAN KATSH, *LAW IN A DIGITAL WORLD* (1995)).

¹¹²Fingerprint evidence has been challenged as inadmissible under *Daubert* in a number of cases, though courts have consistently held such evidence admissible. *See, e.g.*, *United States v. Hernandez*, 299 F. 3d 984 (8th Cir. 2002); *United States v. Havvard*, 260 F. 3d 597 (7th Cir.2001); *United States v. Sherwood*, 98 F. 3d 402 (9th Cir.1996); *United States v. Llera Plaza*, 188 F. Supp. 2d 549 (E.D. Pa. 2002); *United States v. Joseph*, 2001 WL 515213, *1 (E.D.La. May 14, 2001); *United States v. Martinez-Cintrón*, 136 F. Supp. 2d 17 (D.P.R. 2001); *United States v. Mitchell*, 199 F. Supp. 2d 262 (E.D. Pa 2002), *aff'd*, 365 F.3d 215 (3d Cir. 2004).

¹¹³ For a detailed discussion of how fingerprint evidence fails under the *Daubert* standard, see Robert Epstein, *Fingerprints Meet Daubert: The Myth Of Fingerprint "Science" Is Revealed*, 75 S. CAL. L. REV. 605 (2002). For a discussion of how fingerprints gained cultural and judicial acceptance as infallible evidence despite a lack of proof of reliability, see Mnookin, *supra* note 69; *see also* Margaret A. Berger, *Procedural Paradigms for Applying the Daubert Test*, 78 MINN. L. REV. 1345, 1354-56 (1994); Michael J. Saks, *Merlin and Solomon: Lessons from the Law's Formative Encounters with Forensic Identification Science*, 49 HASTINGS L.J. 1069, 1085-86 (1998). For a rebuttal, see Andre A. Moenssens, *Palmprint and Handwriting I.D. Satisfy Daubert Rule: A Brief Analysis of the Case of United States v. Crisp* (2003) and *Some Musings About Its Dissenting Opinion*, <http://www.Forensic-Evidence.com> (last visited Apr. 16, 2006), noting that no appellate court has ever held either fingerprint identification evidence nor handwriting comparison evidence inadmissible. Moenssens asserts that trade journals and scientific articles provide scores of validation research by specialists for fingerprint and handwriting matching, but that research "has simply been ignored or deprecated by the lay critics who have set themselves up as the extreme authorities on...forensic science..." *Id.* He criticizes law reviews and the "erudite and articulate" legal scholars who compose a vocal majority of critics to fingerprint and handwriting under *Daubert*, noting that one or two voices may be disproportionately amplified because "[l]egal authors tend to accept uncritically what is asserted in the same type of publication in which they publish" and frequently ignore scientists' evaluation of forensic evidence conducted in laboratories and accepted within the scientific community. *Id.*

¹¹⁴ Jennifer Mnookin, *Fingerprint Evidence in an Age of DNA Profiling*, 67 BROOKLYN L. REV. 13 (2001).

¹¹⁵ *Id.* at 22 n.29.

Courts are no longer skeptical that by the aid of scientific appliances the identity of a person may be established by finger prints. . . The edge on one blade differs as greatly from the edge on another blade as the lines on one human hand differ from the lines on another. This is a progressive age. The scientific means afforded should be used to apprehend the criminal.¹¹⁶

Elsewhere Mnookin looks to the acceptance of photographic evidence as representative of the process by which new technologies gain acceptance, describing competing and contradictory views of photograph as both objective “machine-made truth”¹¹⁷ and subjective “artifice”¹¹⁸ or artistic representation. She finds that judges tended to draw analogies between photography and forms of representation like diagrams, maps, and drawings, revealing “both the power and the limits of analogic reasoning as a judicial strategy for coping with novelty.”¹¹⁹ While this article looks forward to assess the role analogy currently plays and will continue to play in cultural understanding of a new technology, Mnookin’s looks backward to explore similar claims about the power of analogy to shape perception and legal understandings, tracing the use of analogy in the rise of photographic evidence. Analogizing Brain Fingerprinting to DNA rather than polygraphy makes it more palatable because less apt to usurp the jury’s role and appear to answer the trial’s ultimate question.¹²⁰ Likewise, Mnookin observes that while photography appeared uncontestable and overpowering at first, “the analogy...provided judges with a form of domestication, a way to tame the new technology by linking it to already existing representational forms....”¹²¹

¹¹⁶ *Id.* (citing *State v. Clark*, 287 P. 18, 20 (Wash. 1930)).

¹¹⁷ Mnookin, *supra* note 69 at 20.

¹¹⁸ *Id.* at 14.

¹¹⁹ *Id.*

¹²⁰ A good deal of criticism levied against admission of polygraph evidence plays on the fear that such evidence would in effect replace the jury members, supposed to serve as human “lie detectors.” *See, e.g., State v. Porter*, 241 Conn. 57, 117-18 (1997) (“[T]he importance of maintaining the role of the jury...justifies the continued exclusion of polygraph evidence....[P]olygraph evidence so directly abrogates the jury’s function that its admission is offensive to our tradition of trial by jury.”); *see also United States v. Scheffer*, 523 U.S. 303 (1998); *Aetna Life Ins. Co. v. Ward*, 147 U.S. 76 (1981); *United States v. Barnard*, 490 F.2d 790 (9th Cir. 1973).

¹²¹ Mnookin, *supra* note 69 at 6.

Mark McCormick's frequently cited¹²² revised approach to determining the admissibility of scientific evidence identifies eleven factors the court might use as criteria relevant to admissibility.¹²³ His fourth factor proposes "analogy to other scientific techniques whose results are admissible." The *Daubert* opinion cites the same McCormick article as one of four that provide "variations" on the Court's approach with a different set of factors, and though it does not endorse any of the criteria offered, it grants that they "may well have merit."¹²⁴ Assessing the admissibility of spectrographic voice identification evidence prior to *Daubert*, the court in *United States v. Williams* articulated five factors to consider in determining the reliability of a given technique, one of which was reliability as compared to analogous traditional techniques, the admissibility of which would not be questioned.¹²⁵ *Williams*' and McCormick's proposed reliance on analogy as tool for evaluation seems to this author both misguided and tautological.¹²⁶

¹²² See, e.g., Bert Black, *A Unified Theory of Scientific Evidence*, 56 *FORDHAM L. REV.* 595, 642 n.258 (1988); Cynthia Stevens Kent, *Daubert Readiness of Texas Judiciary: A Study of the Qualifications, Experience, and Capacity of the Members of the Texas Judiciary to Determine the Admissibility of Expert Testimony Under the Daubert, Kelly, Robinson, and Havner Tests*, 6 *TEX. WESLEYAN L. REV.* 1, 8 (1999); Andre Moenssens, *Admissibility of Scientific Evidence—An Alternative to the Frye Rule*, 25 *WM. & MARY L. REV.* 545, 573 (1984); Leslie Morsek, *Get on Board for the Ride of Your Life! The Ups, the Downs, the Twists, and the Turns of the Applicability of the "Gatekeeper" Function to Scientific and Non-Scientific Expert Evidence: Kumho's Expansion of Daubert*, 34 *AKRON L. REV.* 689, 707 n.65 (2001); Richard Nahas, *Daubert v. Merrell Dow Pharmaceuticals, Inc. Requiem for Frye: The Supreme Court Lays to Rest the Common Law Standard for Admitting Scientific Evidence in the Federal Courts*, 29 *NEW ENG. L. REV.* 93, 109 (1994); John D. Borders, Jr., Note, *Fit to be Fried: Frye v. United States and the Admissibility of Novel Scientific Evidence*, 77 *KY. L.J.* 849, 873 n.196 (1989).

¹²³ Mark McCormick, *Scientific Evidence: Defining a New Approach to Admissibility*, 67 *IOWA L. REV.* 879 (1982). The eleven factors are: (1) the potential error rate in using the technique; (2) the existence and maintenance of standards governing its use; (3) presence of safeguards in the characteristics of the technique; (4) analogy to other scientific techniques whose results are admissible; (5) the extent to which the technique has been accepted by scientists in the field involved; (6) the nature and breadth of the inference adduced; (7) the clarity and simplicity with which the technique can be described and its results explained; (8) the extent to which the basic data are verifiable by the court and the jury; (9) the availability of other experts to test and evaluate the technique; (10) the probative significance of the evidence in the circumstances of the case; and (11) the care with which the technique was employed in the case. *Id.* at 911-12.

¹²⁴ *Daubert v. Merrell Dow Pharma., Inc.*, 509 U.S. 579, 595 n.12 (1993).

¹²⁵ *United States v. Williams*, 583 F.2d 1194, 1199 (2d Cir. 1978) ("A further indication of the reliability of spectrographic analysis is its analogous relationship with other types of scientific techniques, and their results, routinely admitted into evidence.").

¹²⁶ To see how McCormick's criterion is mere tautology, see Mnookin, *supra* note 69, at 5, arguing that analogy of photographs to maps, diagrams, and other visual aids was ultimately constitutive of the entire category of visual or demonstrative evidence, justifying admissibility of photographs through analogy to maps and diagrams and simultaneously justifying maps and diagrams through analogy to photographs. See also Mnookin, *supra* note 115, at 57 (highlighting the valuelessness of conferring legitimacy on DNA by linking

Comparing Brain Fingerprinting to a polygraph test or a DNA match is similar to categorizing it a *kind* of lie detector or a *type* of forensic proof, but analogy relies on a one-to-one equivalence, bestowing a faux familiarity on the new form of evidence based on some attribute it shares with an older form. Analogy can also create a false evolutionary chain of evidence when a new technology is touted as “the next” anything, connoting not only comparable authoritativeness but also superiority. Casting a form of evidence as the “next” version of its predecessor positions it as an advancement over the evidence it displaces or bests.¹²⁷ As such, analogy may be more dramatic than prototype, where prototype suggests the new evidence takes its place alongside the similar older form as equally valuable, but not better.

III. BRAIN FINGERPRINTING

A. PLANNING, EXECUTING, & RECORDING

Brain Fingerprinting, an innovative technique for determining the presence or absence of “guilty knowledge” in criminal suspects, relies on electroencephalography to detect a response to stimuli related to the crime. Dr. Lawrence Farwell, Brain Fingerprinting’s inventor, emphasizes that in any crime “the brain is always there, planning, executing, and recording the crime.”¹²⁸ That perpetual presence allows him to test a suspect and glean whether or not the suspect’s brain contains relevant information garnered by investigators, such as facts about the murder weapon, the victim, the events of the day or night in question, the location of the crime, and any other salient details known only to the investigators, the victim, and the perpetrator. Farwell uses EEG technology to evaluate brain responses to

it to fingerprints in view of the fact that fingerprints were never adequately demonstrated to be reliable or valid means of identification by any test or standard for admissibility); Jennifer L. Mnookin, *Scripting Expertise: The History of Handwriting Identification Evidence and the Judicial Construction of Reliability*, 87 VA. L. REV. 1723, 1726 (2001).

¹²⁷ Mnookin does not distinguish among subsets of analogical reasoning as I do. She theorizes that viewing a photograph as “like a painting or verbal description” confers legitimacy on the photograph in the form of “both kin and ancestry.” Mnookin, *supra* note 69, at 54. I appreciate her terminology but would differentiate between the illusion of “kin” that prototypical reasoning creates and that of “ancestry” that the particular form of analogy discussed in this section creates.

¹²⁸ This ubiquitous phrase seems to serve as a default slogan, whether creditable to Farwell’s repetition or reporters’ appreciation and appropriation of it. *See, e.g.*, Sam Simon, *What You Don’t Know Can’t Hurt You*, 32 LAW ENFORCEMENT TECH. 9 (2005); Phil Magers, *New Technology Used in Death Row Case*, UNITED PRESS INT’L, March 1, 2004; John McCrone, *Nowhere to Hide*, NEW SCIENTIST, June 9, 2001, at 2424; *Scientists’ Brainwave on Lie Detection*, DAILY MAIL (London), June 7, 2001, at 11; Laura Spinney, *Are You Guilty? It’s All in the Mind: A New Test Is Being Used to Detect Guilty Memories in Suspects*, INDEP. (London), January 12, 2001, at 8; John Steinbachs, *Move Over DNA, Prints Tool Taps into Criminal Mind*, OTTAWA SUN, Oct. 8, 2000, at 21.

such probe stimuli and compares the responses to those elicited by target stimuli, which the test subject admits to knowing, and irrelevant stimuli, which appear crime-related but are actually fabricated to create a baseline. The subject emits a specific brainwave response when faced with a stimulus noteworthy in the context of the crime.

B. GRINDER & ME

Nineteen eighty-four might not have brought precisely the dystopia George Orwell foretold, but it proved a hard year indeed for twenty-five-year-old Julie Helton and her family. Three days after Helton was reported missing, investigators found her discarded body not too far from her home in Macon, Missouri. Someone in the town of five thousand had beaten, raped, and killed Julie Helton and left her body by the railroad tracks.

Police found a lead in woodcutter James “J.B.” Grinder and brought him and others in for questioning, but Grinder offered investigators a slew of alibis, each one different from the next. Over the fifteen years that followed, police invested more than ten thousand hours investigating the case. They were unable to obtain enough evidence on any suspect to stand a good chance of convicting him. Grinder changed his story repeatedly, sometimes admitting he had played a role in the events, sometimes implicating others, and sometimes denying any involvement or knowledge whatsoever.

After years of frustration, Macon County Sheriff Robert Dawson was close to abandoning the hunt for Helton’s killer when he heard about Brain Fingerprinting. Flipping television stations one evening at home, Dawson saw Farwell discussing Brain Fingerprinting on the Discovery Channel; Dawson’s first thought was of Grinder and his ever-changing alibis. Farwell has been featured in dozens of television shows, news articles, and journals throughout the world, but he has yet to become a household name. He holds several patents on the technology and processes that underlie Brain Fingerprinting. The press coverage Dawson saw touted a machine that uses electroencephalography to match unreleased details of a crime and crime scene to the record found in the perpetrator’s brain, or determine definitively that a suspect’s brain lacks a record of such details. Sheriff Dawson was no psychophysicologist, but he thought Farwell’s innovative application of EEG technology could potentially determine the extent of Grinder’s involvement in the crime and finally enable the state to determine Helton’s attacker. Dawson contacted Farwell in 1999 and Grinder, who was then serving time for an unrelated crime, agreed to take the test.

Successful administration of Brain Fingerprinting requires that some elements of the events in question remain ostensibly unknown to the subject. Sheriff Dawson, Chief Deputy Charles Muldoon, and Randy King of the Missouri Highway Patrol provided Dr. Farwell with the specific

details and background information that enabled him to create a test for Grinder. If Grinder had already learned everything the investigators knew about Helton's murder through the media coverage of the case, the small-town rumor mill, and police interrogation, Farwell would have had no knowledge left for which to test. Investigators were able to provide relevant unreleased crime details of which Grinder claimed ignorance, and Farwell used those details to design Grinder's test.

Brain Fingerprinting relies on a specific, measurable brainwave response known as a P300. The P300 is so called because it is a positive (hence, "P") event-related potential that takes place within between three hundred (hence, 300) and eight hundred milliseconds following exposure to a stimulus that is familiar, noteworthy, or useful to the subject in performing a given task. The stimulus may be visual, aural, or olfactory: The sound of your mother's voice, the smell of her perfume, a photograph of her face, or the text of her name will all produce a P300 response in the proper context. Conversely, an irrelevant stimulus, such as the address of someone you've never met, will not spark the conscious or subconscious "a-ha" instant that elicits a P300.

The P300 was first discovered and documented over forty years ago, and is robust enough to be detected without the sophisticated system of analysis required to locate and analyze other brain responses.¹²⁹ Its validity is well accepted among experts in the field.¹³⁰ Farwell is indeed one of those experts, having relied on the P300 in his research at Harvard and the University of Illinois exploring ways to obtain information from a subject's brain without any overt indications from the subject. In 1986, Farwell and colleague Ted Bashore created a system that allowed a young man named Mike to communicate despite near-total physical paralysis. Following an automobile accident twelve years earlier, the patient could move nothing on his entire body but his eyelids.¹³¹ Farwell and Bashore created a computer program that presented Mike with a matrix of words and ideas that he could

¹²⁹ S. Sutton, M. Braren, J. Zublin, & E. John, *Evoked Potential Correlates of Stimulus Uncertainty* 150 SCIENCE 1187-88 (1965).

¹³⁰ Sue Goetinck Ambrose, *Inside the Criminal Mind: Lawyers, Neuroscientists Grapple with Question: Is the Fault in Our Brains, or in Our Selves?*, DALLAS MORNING NEWS, Feb. 11, 2001 ("[The P300] is widely accepted among scientists as able to distinguish what is familiar to a person, and what is unfamiliar"); Lance O. Bauer & Victor M. Hesselbrock, *Brain Maturation and Subtypes of Conduct Disorder: Interactive Effects on P300 Amplitude and Topography in Male Adolescents*, 42 J. AM. ACAD. CHILD ADOLESC. PSYCHIATRY, 106, 106-15 (2003); S. Kinoshita *et al*, *Long-term Patterns of Change in ERPs Across Related Measurements*, 60 PHYSIOL. BEHAV. 1087, 1087-92 (1993); Tracy Staedter, *Brain Waves Guide Walking Robot*, DISCOVERY NEWS, Jan. 10, 2007 (the P300 is a "well-known, well-characterized response").

¹³¹ Prior to Farwell and Bashore's invention, Mike communicated with his mother only with his eyes. She would recite the alphabet, and her son blinked when she got to the letter he chose. In that way, he could slowly spell out messages to her. E-mail from Dr. Lawrence Farwell, Chairman and Chief Scientist, Brain Fingerprinting Laboratories, Inc., to the author (Mar. 26, 2006) (on file with author).

choose among, and the program detected which words prompted Mike's P300 response. Through a series of such choices, the patient was able to construct entire sentences that the computer then "spoke" through a synthesizer to his loved ones.¹³² This early success led Farwell to contemplate what else he and his colleagues could accomplish using the P300 to glean information, or the presence of information, from a silent subject's brain.

Farwell turned his attention toward "guilty knowledge detection," seeking to discover information in those actively attempting to conceal it. He found the P300 could be used to pick trained FBI agents out of a larger group by measuring subjects' responses to certain training code words.¹³³ He tested the theory on a group of undergraduates, several of whom had committed minor crimes; the P300 revealed accurately which students had participated in which events simply by exposing them all to the same set of stimuli and analyzing their brainwaves during participation.¹³⁴ In another experiment, students participated in one of two mock espionage scenarios and were tested for their knowledge of both scenarios.¹³⁵ Farwell continues to explore the ramifications of his P300 research for medical testing,¹³⁶ marketing applications, and the identification of trained terrorists.¹³⁷

¹³² Mike's first words using the brain-computer interface were "Hello, Mom. How are you?" His mother, who was in another room at the time, heard the words and rushed to Mike's bedside. Interview with Dr. Lawrence Farwell, Chairman and Chief Scientist, Brain Fingerprinting Laboratories, Inc. at in Seattle, WA. (Mar. 15 2006) (on file with author).

¹³³ Lawrence A. Farwell & Sharon S. Smith, *Using Brain MERMER Testing to Detect Concealed Knowledge Despite Efforts to Conceal*, 46 J. FORENSIC SCI. 135 (2001) (citing Lawrence A. Farwell, *Brain MERMERs: Detection of FBI Agents and Crime-relevant Information with the Farwell MERA System*, Proceedings of the International Security Systems Symposium (Washington, D.C., 1993)).

¹³⁴ Lawrence A. Farwell & Emanuel Donchin, *The Truth Will Out: Interrogative Polygraphy ("Lie Detection") with Event-Related Brain Potentials*, 28 PSYCHOPHYSIOLOGY 531 (1991).

¹³⁵ *Id.* at 533.

¹³⁶ Specifically, the P300 and Brain Fingerprinting are uniquely situated to aid in the early detection of Alzheimer's. Lawrence A. Farwell, *Brain Fingerprinting Executive Summary: Medical Diagnostics*, BRAIN FINGERPRINTING LABORATORIES, at <http://www.brainwavescience.com/ExecutiveSummary.php> (last visited May 1, 2007); Lawrence A. Farwell, *Brain Fingerprinting: Medical Applications*, <http://www.brainwavescience.com/medical.php>. For the relationship between Alzheimer's and P300 generally, see T. Frodl, *Value of Event-Related P300 Subcomponents in the Clinical Diagnosis of Mild Cognitive Impairment and Alzheimer's Disease*, 39 PSYCHOPHYSIOLOGY 175, 175-81(2002); J.M. Olichney, *Clinical Applications of Cognitive Event-related Potentials in Alzheimer's Disease*, 15 PHYS. MED. REHABIL. CLIN. N. AM. 205, 205-33 (2004) ("Despite being applied to [Alzheimer's Disease] for about 25 years since the early P300 studies, the full potential of ERPs in helping diagnose and treat AD patients has yet to be realized."); J. Polich, *Alzheimer's Disease and P300: Review and Evaluation of Task and Modality*, 2 CURR. ALZHEIMER RES.495, 495-96 (2005).

¹³⁷ Unsurprisingly, this potential application has generated arguably the most buzz among both civil libertarians who oppose, and watchdog groups who advocate, the use of Brain Fingerprinting as a tool in the "war on terror." *First brain mapping lab in Bangalore*,

Brain Fingerprinting can be administered accurately relying solely on the P300, but in the course of further research Farwell discovered that the P300 is only one piece of a larger response, which he labeled a MERMER (Memory and Encoding Related Multifaceted Electroencephalographic Response). The MERMER encompasses both the P300 peak and its subsequent valley. Though Farwell's claims are not actively disputed, the MERMER lacks the level of recognition and acceptance that the P300 boasts; its status as the P300's lesser-known cousin could affect its admissibility in court, especially in *Frye* states.¹³⁸ Nonetheless, Farwell claims Brain Fingerprinting is 99.9% accurate using only the P300 and closer to 99.99% accurate using his patented MERMER. A Brain Fingerprinting test always provides separate results according to each technique, along with the respective statistical confidence level for a given finding according to each approach. No Brain Fingerprinting test has ever presented a different conclusion using the MERMER than it did relying on the P300 alone.¹³⁹

Farwell and his Brain Fingerprinting technology impressed and intrigued Sheriff Dawson, and in August of 1999 Farwell flew to Missouri to administer the test to J.B. Grinder. In my desire to better understand the process, I recently flew to Washington to experience Brain Fingerprinting firsthand.

Farwell administered Grinder's test upstairs in the Sheriff's office of a small brick prison-house. He administered my test in his own office in Seattle, overlooking Puget Sound. After preparing several spots on my scalp with conducting gel and fastening grounding clips onto my earlobes, Farwell secured a headband equipped with sensors tightly around my head,

HINDUSTAN TIMES (New Delhi), Sept. 16, 2006 ("Major terrorist strikes can be averted with brain fingerprinting."); Brian R.H. Costello *et al*, *A New Forensic Picture Polygraph Technique For Terrorist and Crime Deception System; Educational Psychology Research*, 33 J. INSTR. PSYCHOL. 230, 230 (2006); Marina Murphy, *Infallible Witness: A Scientific Test That Taps Brain Records So Accurately It Caught Out a Serial Killer, May Prove to be the First Objective, Empirical Measurement of Memory Loss and Drug Efficacy in Alzheimer's and Other Brain Disorders*, CHEMISTRY & INDUSTRY, March 15, 2004 at 10; Neil Parmar, *Deception Detection: Brain Fingerprinting Spots Crime and Innocence*, 37 PSYCHOL. TODAY 30, 30 (2004); Steven Rose, *We are Moving Ever Closer to the Era of Mind Control: The Military Interest in New Brain-scanning Technology is Beginning to Show a Sinister Side*, OBSERVER (England), Feb. 5, 2006, at 31; David Rowan, *Technology Column*, THE TIMES (London), Oct. 1, 2001; Chris Tinkler, *I'll Solve Her Murder*, SUNDAY HERALD SUN (Melbourne), July 21, 2002, at 1.

¹³⁸ Farwell's application of the MERMER has been published and peer reviewed. Farwell & Smith, *supra* note 134.

¹³⁹ Harrington Transcript, *supra* note 15, at 19; Lawrence A. Farwell, *Supplement to Forensic Science Report: Brain Fingerprinting Test on Terry Harrington, Re: State of Iowa vs. Terry Harrington in the Iowa District Court for Pottawattamie County at Council Bluffs*, <http://www.brainwavescience.com/HarringtonSupplement.php> ("Using the full MERMER doesn't change the results; it only gives us more data to work with so we get a higher statistical confidence.").

just as he had fastened one to J.B. Grinder's head more than six years earlier. I wore khakis and a black sweater; Grinder wore a prison-issued orange jumpsuit, and Farwell asked the guards to remove Grinder's handcuffs. Grinder and I each sat facing a large blue screen. Farwell always positions himself out of his test subject's line of vision, in front of another screen where he can watch stimuli and results in real-time.

Before the test, Farwell reminded me of what I already knew: Julie Helton was killed with some instrument, though I didn't know what it was; one part of the crime took place in a trailer, though I didn't know where it was located; some items were taken from the trailer, but I didn't know what; one object was left by the road later on, and another discarded in bushes.¹⁴⁰ Those facts would lead me to recognize the phrases *trailer*, *by road*, and *in bushes*: Those phrases served as targets for me in the context of the crime. Other words I saw were not foreign to me; I cut up a mango with a *knife* for breakfast the morning of the test, I played softball with a *bat* for years, and I've never held a *gun* but I'm certainly afraid of them and associate them more closely with crime than I do the other two objects. In the context of Helton's murder, though, none of those words was any more or less noteworthy to me than any other.

Like me, Grinder claimed to know only limited facts about Helton's death when he underwent Brain Fingerprinting. Before the test, he was reminded of both the elements of the crime he acknowledged knowing for various reasons, and those he allegedly did not know. Farwell provided him a list of every word that could flash before him, along with the descriptors those words matched, in order to contextualize the terms.¹⁴¹ The subject is always asked to read those words and phrases to himself, precluding any experimenter bias that might result if someone else read them to the subject. The subject is given every opportunity to "remember" something he forgot he knew, or object that a stimulus holds special significance for him,¹⁴² before the test begins. That process precludes a subject from believably asserting after the test that he already knew about a probe for some reason

¹⁴⁰ Helton's rape and her murder took place in two different locations. Letter from Dr. Lawrence Farwell, Chairman and Chief Scientist, Brain Fingerprinting Laboratories, Inc., to author (Mar. 26, 2006) (on file with author).

¹⁴¹ Once a subject reviews the targets and confirms that he can recognize them, he is given an alphabetical list of the targets, probes, and irrelevants he will see in a given block before viewing that block, without the test administrator differentiating among the three types of stimuli. He is also given the descriptions of the stimuli for that block; in my case and Grinder's, that description was "In this test you will see where the crime took place, items that were thrown away after the crime, and where these items were thrown." E-mail from Dr. Lawrence Farwell, Chairman and Chief Scientist, Brain Fingerprinting Laboratories, Inc., to author (Mar. 26, 2006) (on file with author).

¹⁴² For example, in the Harrington case, discussed *infra*, Terry Harrington identified to Farwell a name, designed to be an irrelevant, that was actually the name of someone Harrington knew. That stimulus was consequently removed from the test lest it skew the results.

or that the probe held special significance for him.¹⁴³

Three kinds of stimuli compose the Brain Fingerprinting test: 1) targets, 2) irrelevant, and 3) probes. Targets are designed to elicit a P300 or MERMER response. My targets consisted of the information that we both knew I knew: Helton was killed in a trailer, so when I saw the word *trailer*, my brainwaves revealed my recognition. Irrelevant stimuli look like they could be crime-related, but are actually fabricated details with which I would not be familiar whether or not I committed the crime in question, and which would never produce a P300 or MERMER response. In any test, whether mine or Grinder's, the irrelevant will provide a baseline of how our respective brain responds to unfamiliar information, and the targets will provide a baseline of what our brains do when they recognize the stimulus presented as significant or revelatory in the context of the crime. Probes, then, consist of information that investigators have discovered but that is known only to them, the perpetrator, and the victim. If my brain's responses to probes resembles my brain's responses to irrelevant stimuli, then the Brain Fingerprinting will result in a finding of "information absent": The crucial information that stands to prove my role in the crime is simply not recorded in my brain. If, on the other hand, the test reveals that I recognize the probes the same way I recognized the targets, the finding will be "information present," indicating that I know salient details of the crime that I earlier denied knowing, such as the type of weapon used (*knife*) or the item the perpetrator stole from the crime scene (*camera*).

Magazine descriptions of Brain Fingerprinting often glamorize its ability to instantaneously expose "the truth" about how much a subject actually knows about a set of events. In reality, the process is extensive, unglamorous, and exhausting, and it was assuredly far more tedious for Grinder than for me. We each held a mouse in our hands and clicked the left button when we saw targets and the right button in response to all other prompts. That exercise maintains the subject's engagement in the process and keeps her from staring at her own nose instead of the words on the screen. Words flash for three tenths of a second and then disappear, but they are repeated dozens of times.¹⁴⁴ The computer randomized the order of the

¹⁴³ E-mail from Dr. Lawrence Farwell, Chairman and Chief Scientist, Brain Fingerprinting Laboratories, Inc., to author (Mar. 26, 2006) (on file with author).

¹⁴⁴ It is crucial for the reliability and accuracy of the Brain Fingerprinting test that each stimulus is repeated a large number of times and the responses averaged. This repetition is one of several factors that differentiates Farwell, Donchin, and Smith's P300 research from that of Rosenfeld et al. J.P. Rosenfeld, M. Soskins, G. Bosh, & A. Ryan, *Simple, Effective Countermeasures to P300-based Tests of Detection of Concealed Information*, 41 PSYCHOPHYSIOLOGY 205 (2004). The two are sometimes compared, but Rosenfeld's low level of success results from several key missteps in the testing process. The number of trials collected by Rosenfeld is one-tenth the number Farwell collected in the Harrington case, and about one-fifth the number collected for each subject in the Farwell and Donchin study; such a small number of trials will not produce accurate results, because extraneous brainwave signals contaminate the response and require a far higher signal-to-noise ratio.

words that I saw before me, flashing the eighteen stimuli four times apiece in about four minutes for every seventy-two-stimulus block. My only set consisted of four blocks, so I saw probes like *knife* and targets like *in bushes* a total of sixteen times apiece. Grinder, on the other hand, saw many more stimuli in many more blocks. That deluge of stimuli ensures enough data for definite determinations with strong statistical confidence, since the computer averages responses to each stimulus to create a composite version of the subject's response. My and Grinder's electrical brain responses were amplified, digitized, and saved to a disk. At the end of the test, the computer analyzed the stored results, graphed our targets, irrelevant, and probes, generated a finding of "information present" or "information absent" for those telling probes, and calculated a statistical confidence figure.

My readout strongly suggested that I lacked a record of the key information that would be known to someone who killed Julie Helton, and my test's finding was "information absent" with respect to the salient details of her murder. Grinder's readout indicated, with a statistical confidence level of 99.9%, that crime-related information resided in his brain.¹⁴⁵ Grinder's EEG confirmed he knew the missing pieces: The *knife* with which he stabbed Helton, he later deposited *in bushes*; the stolen *camera* he tossed *by the road*; at least part of the crime took place in a *trailer* located on *Lingo Road*. Targets and probes alike elicited the telltale P300 response, suggesting Grinder's earlier ignorance was feigned.

After my Brain Fingerprinting test, Farwell confronted me with its results. Staring intently at the computer screen gave me a nasty headache, the clips left indentations on my earlobes, and the gel for the electrodes had hardened in my hair. I took two aspirin and a hot shower. After Grinder's Brain Fingerprinting test, Farwell confronted him with its results. Grinder subsequently confessed in detail to the murders of Helton and several other young women whose disappearances had been as yet unsolved. He is currently serving life in prison. Farwell describes Grinder as without affect or remorse during his confession, indicating investigators and members of a

In addition, Rosenfeld failed to use optimal digital filtering procedures in his data analysis generally and applied different mathematical criteria, notably neglecting to allow for any inconclusive findings and declaring subjects "guilty" or "innocent." Brain Fingerprinting's algorithm, on the other hand, uses bootstrapping to compute a statistical confidence for each determination of "information absent," "information present," or "indeterminate." Rosenfeld relies on a parametric criterion for computing statistical confidence, while Farwell and his colleagues employ a non-parametric criterion. In other words, Rosenfeld's "effective counter-measures" may be effective against his own technique for information detection, but remain untested against the technique employed in Brain Fingerprinting. Lawrence Farwell, *Scientific Differences Between the Brain Fingerprinting Technique and Rosenfeld's Technique for Detection of Concealed Information 7* (2006) (unpublished manuscript, on file with author).

¹⁴⁵ Lawrence A. Farwell, Forensic Report Prepared for Sheriff Robert Dawson, Macon County Mo. (Aug. 5, 1999), available at <http://brainfingerprinting.com/GrinderForensicReport.php>.

jury would have been hard-pressed to read his sincerity by watching him testify. Grinder did not reveal “any recognition of how horrific the actions he described were.” Rather, he “described planning and committing a rape and a very violent murder as if he were talking about a trip to the grocery store.”¹⁴⁶

C. BRAIN FINGERPRINTING GOES TO COURT

Several years after his involvement in the Grinder case, Farwell received a request to design a Brain Fingerprinting test for Terry Harrington, a young black man serving life imprisonment for murdering a white policeman in the late nineteen-seventies. From the day of his arrest, Harrington unwaveringly maintained his innocence and swore that he had spent the night in question at a concert with friends. Several confirmed his alibi, but one witness, Kevin Hughes, testified that he and Harrington had driven together to a dealership to steal a car that night, and that Harrington had shot and killed the policeman who was working as a security guard at the lot.

Farwell traveled to the Iowa State Penitentiary and conducted two different Brain Fingerprinting tests on Harrington. The first test established with 99.9% confidence that, while the details of the crime known to Harrington from the trial and investigation produced a P300 response and established a baseline recognition despite having taken place in 1977, all tested salient details of the crime and crime scene that would be known only to the perpetrator and investigators were unfamiliar to Harrington: His test produced a finding of “information absent.” A week later, Farwell conducted a second test he designed based on elements of the concert that served as Harrington’s alibi: The finding was “information present” with the same 99.9% confidence level.¹⁴⁷ Confronted with the results of

¹⁴⁶ After the test, Grinder not only admitted his participation, he also described the crime in considerable detail to me.

...[H]e seemed to lack any of the normal human emotions one would expect in such a situation. He did not seem to show any remorse, any concern for the suffering of the victim and her loved ones, or any recognition of how horrific the actions he described were. I remember that he said that after having been bound, raped, and beaten the victim was ‘bawling and wanting to go home.’ Grinder’s demeanor and tone of voice were like what a normal person might use to describe an unruly two-year-old who was fussing because someone had snatched his candy, rather than a victim pleading for her life. He described planning and committing a rape and a very violent murder as if he were talking about a trip to the grocery store.

E-mail from Dr. Lawrence Farwell, Chairman and Chief Scientist, Brain Fingerprinting Laboratories, Inc., to author (Mar. 26, 2006) (on file with author).

¹⁴⁷ The statistical confidence level was 99.99% using the MERMER, or 99% using the P300 alone. Lawrence A. Farwell, *Supplement to Forensic Science Report: Brain Fingerprinting Test on Terry Harrington, Re: State of Iowa vs. Terry Harrington in the*

Harrington's Brain Fingerprinting test, Kevin Hughes recanted his testimony and confessed to perjuring himself at the original trial. The appeals court treated the results of the Brain Fingerprinting test as admissible, but chose not to overturn its verdict, granting Harrington a new trial on the basis of a *Brady* violation.¹⁴⁸ The Iowa Supreme Court did not address Brain Fingerprinting directly, but the State concluded it lacked adequate evidence to retry Harrington.

The Judge in *Harrington* ruled Brain Fingerprinting admissible under *Daubert* after conducting a day-long hearing featuring three expert witnesses, each renowned in his field. In addition to Farwell, the Defense called Dr. William Iacono on behalf of Harrington; the State called Emanuel Donchin for the Prosecution. Farwell and Iacono testified that the science underlying Brain Fingerprinting has been tested, peer reviewed, and published, citing Farwell's patents¹⁴⁹ and several publications.¹⁵⁰ They testified that the science of Brain Fingerprinting is accurate and generally accepted in the scientific community. Donchin did not contest Farwell and Iacono's assertions, concurring in the above and acknowledging "the P300 side is absolutely perfect...to the extent its scientific data are good. We know that if you get a P300 to a stimulus, the subject responded to it and the brain responded to it in a certain way."¹⁵¹ Donchin testified that he could not agree or disagree with Farwell's conclusion because he lacked sufficient

Iowa District Court for Pottawattamie County at Council Bluffs, at 19-20, <http://www.brainwavescience.com/HarringtonSupplement.php>.

¹⁴⁸ *Harrington v. State*, 659 N.W.2d 509 (2003) Iowa Sup. LEXIS *35, rev'g *State v. Harrington*, 284 N.W.2d 244, 1979 Iowa Sup. LEXIS 1010 (1979).

¹⁴⁹ Method and Apparatus for Multifaceted Electroencephalographic Response Analysis (MERA), U.S. Patent No. 5,363,858 (filed May 5, 1993) (issued Nov. 15, 1994); Method and Apparatus for Truth Detection, U.S. Patent No. 5,406,956 (filed Feb. 11, 1993) (issued Apr. 18, 1995); Method for Electroencephalographic Information Detection, U.S. Patent No. 5,467,777 (issued Nov. 21, 1995).

¹⁵⁰ John G. Allen, William G. Iacono, & Kurt D. Danielson, *The Identification of Concealed Memories Using the Event-Related Potential & Implicit Behavioral Methods: A Methodology for Prediction in the Face of Individual Differences*, 29 *PSYCHOPHYSIOLOGY* 504 (1992); Lawrence A. Farwell & Emanuel Donchin, *The Brain Detector: P300 in the Detection of Deception*, 24 *PSYCHOPHYSIOLOGY* 434 (1986); Lawrence A. Farwell, *et al.*, *Optimal Digital Filters for Long-Latency Components of the Event-Related Brain Potential*, 30 *PSYCHOPHYSIOLOGY* 306 (1993); Lawrence A. Farwell & Emanuel Donchin, *Talking Off the Top of Your Head: Toward a Mental Prosthesis Utilizing Event-Related Brain Potentials*, 70 *ELECTROENCEPHALOGRAPHY & CLINICAL NEUROPHYSIOLOGY* 510 (1988); Lawrence A. Farwell & Emanuel Donchin, *The Truth Will Out: Interrogative Polygraphy ("Lie Detection") with Event-Related Brain Potentials*, 28 *PSYCHOPHYSIOLOGY* 531 (1991); Lawrence A. Farwell, *Two New Twists on the Truth Detector: Brain-Wave Detection of Occupational Information*, 29 *PSYCHOPHYSIOLOGY* 20 (1992); Lawrence A. Farwell, *The Brain-Wave Information Detection (BID) System: A New Paradigm for Psychophysiological Detection of Information* (1992) (unpublished Ph.D. dissertation, University of Illinois at Urbana-Champaign).

¹⁵¹ *Harrington* Transcript, *supra* note 15.

information about the case and the stimuli,¹⁵² but agreed that Farwell's publications demonstrated his skillful development of stimuli.¹⁵³ Unable to resist the siren call of analogy, Donchin testified in the hearing that while sound science underlies Brain Fingerprinting, its administration relies on skill, "just like fingerprints."¹⁵⁴

IV. PERCEPTION AND PRESENTATION

Media coverage of Brain Fingerprinting consistently characterizes it as the "next" or "new" form of some preexisting technology, whether in order to advance journalists' own view of Brain Fingerprinting or simply to render something complex more understandable to lay readers. The most popular comparison journalists rely upon is that of polygraphy, characterizing Brain Fingerprinting as the newest lie detector or the next polygraph.¹⁵⁵ Farwell decries such analogy as inaccurate¹⁵⁶ and prefers to

¹⁵² *Id.* at 203.

¹⁵³ *Id.* at 225.

¹⁵⁴ *Id.* at 208.

¹⁵⁵ See, e.g., Sally Satel, *Mind Over Gray Matter*, N.Y. TIMES, June 19, 2005, at 21 (reviewing MICHAEL S. GAZZANIGA, *THE ETHICAL BRAIN* (2005)) ("just like conventional polygraph tests, [tests like Brain Fingerprinting are] fraught with uncertainties." (quoting Gazzaniga)); Kathy Bergstrom, *A New Crime Fighting Tool?* DES MOINES REGISTER, Aug. 8, 1999; Ariana Eunjung Cha, *Lie-Detecting Devices: Truth or Consequences?*, *Unproven but Popular, Mainstream Systems Can Be Used Without Subject's Knowledge*, WASH. POST, Aug. 18, 2002, at A01; Chris Clayton, "Brain Fingerprints" as Defense?, NAT'L L. J., Nov. 20, 2000, at A4; Barnaby J. Feder, *Truth and Justice, by the Blip of a Brain Wave*, N.Y. TIMES, Oct. 9, 2001, at F3; Lila Guterman, *Gray Matters*, CHRON. HIGHER EDUC., June 25, 2004, at 22; Joann Loviglio, *Researchers Seek Better Lie Detector; Some Are Using MRIs, Others Are Measuring Blood Flow to the Brain*, TELEGRAPH HERALD (Dubuque), June 7, 2003, at D6; Tom Paulson, "Brain Fingerprinting" Touted as Truth-Meter: Scientist Says Guilt or Innocence Can Be Assessed by Testing Electrical Brain Waves, SEATTLE POST-INTELLIGENCER, Mar. 1, 2004, at A1; Tom Paulson, *Seattle-Bound Company Uses Brainwaves To Detect Lies*, SEATTLE POST-INTELLIGENCER, Jan. 29, 2004, at E1 ("[Brain Fingerprinting would] use[] brain waves as a replacement for the criminal polygraph."); Deirdre Shesgreen, *Congress Is Looking at High-Tech Hardware Designed to Thwart Terrorists*, ST. LOUIS POST-DISPATCH, Oct. 21, 2001, at B5; Caryn Tamber, *Brave Neuro World*, DAILY RECORD (Baltimore), Dec. 30, 2005 ("One neuroimaging-based lie detector, Brain Fingerprinting, has already been admitted into evidence in a murder appeal in Iowa."); Clive Thompson, *The Year in Ideas: A to Z: The Lie Detector That Scans Your Brain*, N.Y. TIMES, Dec. 9, 2001, at 82; Patricia Wen, *Scientists Eyeing High-Tech Upgrade for Lie Detectors*, BOSTON GLOBE, June 16, 2001, at A1; David Zizzo, *Forensic Investigations Turning to Brain Waves*, SUNDAY OKLAHOMAN, Mar. 14, 2004, at 5A; *Revealing Thoughts; A New Technique May Be Able to Expose Guilty Minds. If It Catches On, Leaving Fingerprints Behind May Soon Be the Lease of a Criminal's Worries*, SUN-SENTINEL (Fort Lauderdale), July 1, 2001, at 6G.

¹⁵⁶ Iacono, too, rejects the comparison of Brain Fingerprinting to polygraphy:

Q [H]ow would you say that Dr. Farwell's extension to guilty knowledge test would differ from a convention polygraph test?

A It's very different...The only thing they share in common is that a conventional polygraph test and this extension both involve recording

tie Brain Fingerprinting rhetorically with DNA, highlighting similarities between the two; many writers have followed his lead.¹⁵⁷ Obviously, the name “Brain Fingerprinting” draws a parallel between the technology and fingerprinting itself, “the very archetype of reliable expert testimony.”¹⁵⁸ Others have construed Brain Fingerprinting as providing the government with greater potential to violate citizens’ privacy, comparing Farwell’s creation with wiretapping or surveillance. Still others, excited about Brain Fingerprinting’s ability to determine whether someone is a member of a controversial group or has been trained by a terrorist, equate Brain Fingerprinting with airport security measures like metal detectors and drug-sniffing dogs. One writer likens Brain Fingerprinting to the ability to predict future crimes exhibited by the “pre-cogs” of Steven Spielberg’s movie “Minority Report.”¹⁵⁹ References to Orwell and “Big Brother” abound.¹⁶⁰

physiological signals from humans, but beyond that, they really deal with different topics. Dr. Farwell's technique is intended to assess memory, in particular, recognition memory and whether or not people...recognize information that's relevant to a crime. In conventional lie detection techniques, we are measuring particularly autonomic nervous system response; not brain responses, to determine whether or not people are lying or trying to deceive in their response to different questions. And the lie detector technology is very subjective and based on a number of assumptions that are made about how the procedure works that are not generally accepted in the scientific community.

Harrington Transcript, *supra* note 15 at 180.

¹⁵⁷ See, e.g., Beth Daley, *Foolproof Forensics? Even Science May Not Make a Death Sentence Infallible*, BOSTON GLOBE, June 8, 2004, at E1 (“By the late 1980s, DNA testing had been widely adopted, and today technology is still marching on: A new technique called ‘brain fingerprinting’, a kind of lie detector based on brain signals, was admitted into court in Iowa in 2003 in order to help free a man in prison for murdering a retired police officer.”); Abigail Johnson, *Brain Analysis Tests Knowledge*, IND. LAW., Mar. 24, 2004, at 7 (“[B]rain fingerprinting will need to go through more proving in court...the same thing happened with DNA and fingerprinting analysis.”); Clark Kauffman, *Inventor, State Aid Both Gone from Iowa; \$125,000 for High-Tech Tool Yields Controversy, One Full-Time Job*, DES MOINES REGISTER, Sep. 5, 2004, at 1A (“Farwell[’s]... brain fingerprinter could represent the most significant advance in forensic science since DNA testing.”); Jean Prescott, *Science on the Screen*, HOUSTON CHRON., Feb. 17, 2004 (“Brain Fingerprinting...could be the step beyond DNA analysis, the next innovation in crime detection.”); David Zizzo, *Forensic Investigations Turning to Brain Waves*, SUNDAY OKLAHOMAN, Mar. 14 2004, at 5A (“[Brain Fingerprinting] is only another tool, such as DNA evidence, for courts to use to decide cases.”). See also Farwell’s testimony in Harrington:

[Brain Fingerprinting is] just like, say, DNA evidence. If there is no DNA at the scene of the crime, we will not be able to try to match the DNA with the suspect at the scene of the crime. If we can't discover any information from the crime that the subject would know, if and only if he's committed the crime, [Brain Fingerprinting will not be feasible].

Harrington transcript, *supra* note 15, at 24.

¹⁵⁸ United States v. Havvard, 260 F. 3d 597 (7th Cir. 2001).

¹⁵⁹ MINORITY REPORT (Twentieth Century Fox & Dreamworks 2002); Barry Steinhardt, *Privacy: Big Brother Is No Longer Fiction*, CHARLESTON GAZETTE, Feb. 9, 2003, at 1.

Journalists often begin discussions of Brain Fingerprinting by distinguishing it from the modern polygraph, but such a distinction is always already founded upon the assumption that the two warrant comparison. Brain Fingerprinting is treated as, in turn, a new and improved polygraph by those who endorse it; a scarier, potentially more trusted and hence more dangerous polygraph by those who oppose it; a more valid and reliable polygraph by those who appreciate the science that supports it. Any such statement relies on analogizing Brain Fingerprinting to polygraphy, characterizing the purpose of Brain Fingerprinting as lie detection and suggesting its promises and pitfalls to be comparable to those of polygraphy until revealed otherwise.

Disavowing that metaphor and aligning Brain Fingerprinting instead with forensic evidence like fingerprinting may be a strategically wise move for those with a stake in Brain Fingerprinting's admissibility. Many other evidentiary forms have succeeded in piggybacking on fingerprinting's stellar reputation as incontestable proof, from tool mark identification to DNA.¹⁶¹ Farwell and his colleagues describe Brain Fingerprinting as able to determine a "match" between crime scene evidence and the record stored in an individual's brain, just as fingerprinting and DNA seek a match. Such an analogy is also powerful because forensic evidence claims to be inconclusive as to the ultimate question, even though it often functions practically to guide a jury directly to decision. Where DNA or fingerprinting may declare that the defendant's prints or blood or hair were found at the crime scene, the finders of fact remain free to determine that the defendant might have visited the scene but did not pull the trigger, or that a racist police officer or crafty accomplice planted the evidence. With true lie detection, a finder of fact has no facts to find if a trustworthy machine declares the defendant is lying when he testifies he didn't do it. As such, placing Brain Fingerprinting in the category of fingerprinting-like things allows a jury to consider a finding of "information present" as merely a "match," preserving the jury's autonomy in enabling it to determine what weight it will place on the evidence. Media coverage of Brain Fingerprinting is peppered with mentions of DNA, although such a comparison ranks second in frequency to that of lie detection.

¹⁶⁰ See, e.g., Bergstrom, *supra* note 156; Robin Marantz Henig, *Looking for the Lie*, N.Y. TIMES, Feb 5, 2006, at 47; Russ Kick, *Gotcha!* VILLAGE VOICE, Feb. 27, 2001, at 33; Steinhart, *supra* note 160; David Streitfeld & Charles Piller, *Response to Terror; A Changed America; Big Brother Finds Ally in Once-Wary High Tech*, L.A. TIMES, Jan. 19, 2002, at A1. Many others allude to ALDOUS HUXLEY, *BRAVE NEW WORLD* (1932) or science fiction generally, fearing from Brain Fingerprinting "another weapon in the arsenal of those who want to put us into a surveillance society where every action, every deed and one's very thoughts can be monitored, categorized and correlated." Loviglio, *supra* note 156; Rodney J. S. Deaton, *Neuroscience and the In Corpore-ated First Amendment*, 4 FIRST AMEND. L. REV. 181, 204 (2006).

¹⁶¹ See Mnookin, *supra* note 115, at 22 n.29.

V. “PERSUASIVENESS & MANIPULATION”: IMPLICATIONS FOR NOVEL EVIDENCE

One theorist in the field of Visual Studies notes that fear of novel technology is marked by dual anxieties of “persuasiveness and manipulation.”¹⁶² We ought to fear the same phenomena when approaching analogy applied to that novel technology, whether a given analogy is painstakingly or haphazardly selected. The decision in *Williams* weighs the danger that jurors will be “awed” by voice spectrography’s “aura of mystic infallibility.”¹⁶³ Scholars in the nineteenth century who opposed a new technology denounced its potential to “prejudice the jury and obscure the truth,” while advocates of the same technology “championed the way that its persuasiveness and manipulability made achieving the truth more pure.”¹⁶⁴ The same ambivalence marks reactions to innovation today, and manifests itself in reactions to Brain Fingerprinting, which may one day seem as basic to judges and jurors as photography does now.

Cass Sunstein identifies analogical reasoning’s “four distinctive properties” as “a requirement of principled consistency, a focus on concrete particulars, incompletely theorized judgments, and the creation and testing of principles having a low or intermediate level of generality.”¹⁶⁵ He adds that analogical reasoning may at times impede facts or progress, and laments that while it forms the basis of legal thought and boasts many “beneficial features,” it appears “at best primitive on the important issue of likely social consequences.”¹⁶⁶ Indeed, a reliance on analogy in the courtroom too often provides immediate gratification and clarification, but later returns to haunt its architect or its adherents when the inappropriateness of the comparison becomes evident. What are the social consequences of analogy? By actively employing or passively allowing

¹⁶² Christopher J. Buccafusco, *Gaining/Losing Perspective on the Law, or Keeping Visual Evidence in Perspective*, 58 U. MIAMI L. REV. 609, 618 (2004).

¹⁶³ *United States v. Williams*, 583 F.2d 1194, 1199 (2d Cir. 1978). The court acknowledges such a danger is always present when dealing with scientific evidence and “fancy devices” foreign to lay jurors, but concludes that the objection has less force in the context of the particular spectrographic evidence in question, because its “critical...simple step of visual pattern-matching [is] easily comprehended and evaluated by a jury.” For the origin of the phrase, see *United States v. Addison*, 498 F.2d 741, 744 (D.C. Cir. 1974) (“scientific proof assume a posture of mystic infallibility in the eyes of a jury of laymen.”); *United States v. Amaral*, 488 F.2d 1148, 1152 (9th Cir. 1973) (referring to scientific testimony’s “aura of special reliability and trustworthiness.”); *D’Arc v. D’Arc*, 385 A.2d 278 (N.J. Super. Ct. Ch. Div. 1978), *aff’d*, 421 A.2d 602 (N.J. Super. Ct. App. Div. 1980) (noting scientific evidence has a “posture of mystic infallibility” (quoting *United States v. Addison*, 498 F.2d 741 (1974))). Similarly, Saks & Kidd refer to quantitative evidence’s “aroma of certitude.” Michael J. Saks & Robert F. Kidd, *Human Information Processing and Adjudication: Trial by Heuristics*, 15 LAW & SOC. REV. 123, 124 (1980-81).

¹⁶⁴ Buccafusco, *supra* note 163, at 621.

¹⁶⁵ Sunstein, *supra* note 94, at 790.

¹⁶⁶ *Id.*

analogy as a shortcut to assimilate some unknown element, judges may forego adequate analysis of the novel thing analogized by adopting the already-analyzed characteristics of the target of analogy. In allowing experts and attorneys to present Brain Fingerprinting as like DNA, like fingerprints, like polygraphy, or like anything other than itself, a judge sets the standard in her courtroom of seeking not truth and justice, but like-truth and like-justice.

Despite sophisticated and nuanced analyses of rhetorical and cognitive trends in legal reasoning, the vast majority of sources cited conclude without value judgment, lamenting the havoc a good metaphor can wreak in a courtroom but weighing it evenly against the benefits the metaphor bears, or refusing to eschew analogy because the cost would be too great and the endeavor impossible. While such tropes will likely always have a place in legal reasoning, this paper advocates a more aggressive approach. If judges are to preside as keepers who open or shut the gates to scientific evidence, let the gatekeeper metaphor preclude any other metaphors that would sneak through those gates in disguise or as disguise, rather than standing trial honestly. Brain Fingerprinting seems to meet every standard of admissibility under Rule 702; scrutinize it according to its merits, not the merits of the thing it most closely resembles or the category into which it purports to fit. If journalists, scientists, and jurors understand and process novel evidence by comparing it to the familiar, *Daubert* asks judges to take on the more strenuous challenge of which perhaps only judges are capable. Examine the evidence on its own terms, from every angle, impartially and without analogy.